STUDENT HANDBOOK
(2016/2017)

FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRI LANKA

Table of Contents

FACULTY OF APPLIED SCIENCES
RAJARATA UNIVERSITY OF SRI LANKA

1. INTRODUCTION

1.1. BACKGROUND

The Rajarata University of Sri Lanka (RUSL) was established in November 1995 by the Gazette Notification No: 896/2 of 7th November 1995 in the Administrative District of Anuradhapura. The Central Province Affiliated University College (CPAUC) in Polgolla, located at a distance of 140 km from the main campus at Mihintale was amalgamated to the RUSL as its Faculty of Applied Sciences (FASc). The immediate task of the FASc at that time was to upgrade all the students of the CPAUC who had successfully completed their Diploma requirements, to the Graduate level. On this task the FASc was inaugurated on 10thJanuary, 1997 to commence the third year Degree Programme with a batch of 102 students, who subsequently graduated in 1998. The first batch of students who were directly sent by the UGC to follow the degree programme was enrolled in November 1997.

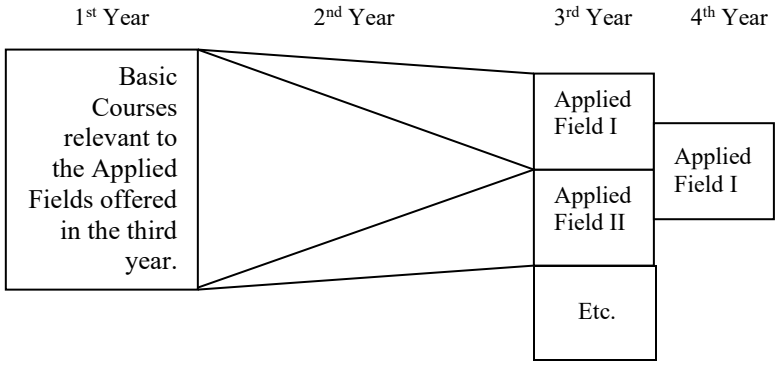
After functioning for nearly 10 years at Polgolla, the Faculty was finally established in the premises of the main campus at Mihintale, on 16th January 2006 upon completion of Stage I of the building complex.

1.2. PRESENT STATUS

At present, three B.Sc. (General) Degree programmes, two B.Sc. (Special) Degree programmes, two B.Sc. (Joint Major) Degree programmes and three B.Sc. (Four-year) Degree programmes are offered by the FASc.

The FASc, Mihintale consists of two departments *viz:* Biological Sciences and Physical Sciences. The Department of Biological Sciences offers courses in the fields of study/subjects/disciplines of Botany, Zoology, Biology and Health Promotion while the Department of Physical Sciences offers Chemistry, Physics, Pure Mathematics, Applied Mathematics, Computer Science and Information & Communication Technology. All courses are offered in English medium. As such, the Faculty conducts an intensive course and an ongoing course in English Language, for students to be competent to follow lectures and comprehend the courses taught by the two Departments. From its inception, the Faculty follows the course unit system.

It is the intention of the Faculty to ensure that a student entering the Faculty could, in the third and fourth years select a particular field or fields of Applied Sciences of his/her choice. The first and the second year courses are designed in such a way that a student may select a specific area/s in Applied Sciences in the third year/third and fourth years. The basic plan of action of the B.Sc. Degree Programmes in Applied Sciences is given below.



However, this is not applicable to the students following the degrees of Information & Communication Technology and Health Promotion, who are selected by entry, through a separate window at the time of admission.

2. STAFF

2.1. OFFICERS OF THE UNIVERSITY

Vice-Chancellor: Prof. K.H.R. Wijayawardana

Deans of Faculties:	Agriculture:	Dr. A.M.J.B. Adikari
	Applied Sciences:	Dr. (Mrs.) Sriyani Wickramasinghe
	Management Studies:	Dr. K.G.A. Udayakumara
	Medicine & Allied Sciences:	Prof. S. Siribaddana
	Social Sciences & Humanities:	Dr. C.R. Withanachchi
	Technology:	Dr. B.A. Karunaratne
Registrar:	Mr. A.M.G.B. Abeysinghe	
Librarian:	Mrs. A.S. Siriwardena	
Bursar:	S.S. Godakumbura (Acting)	

2.2. STAFF OF THE FACULTY

Dean: Dr. (Mrs.) Sriyani Wickramasinghe
B.Sc. (Hons) (Colombo), M.Sc. (Colombo), Ph.D. (AIT, Thailand)

2.2.1 ACADAMIC STAFF OF THE FACULTY

Department of Biological Sciences

Head: Dr. Rajnish Vandercone
B.Sc. (Hons) (Perad.), Ph.D. (Washington, USA)

Professor: Prof. Sanath Hettiarachchi,
B.Sc. (Hons) (Kelaniya), M.Sc., Ph.D. (Brussels)

Senior Lecturers: Dr. (Mrs) P. L. Hettiarachchi
B.Sc. (Hons) (Colombo), M.Sc., Ph.D. (Brussels), C.Biol. (Sri Lanka), F.I.Biol. (Sri Lanka)

Dr. (Mrs) T. V. Sundarabarathy
B.Sc. (Hons) (SJP), M.Sc. (Perad.), SEDA (UK), Ph.D. (Perad.)

Dr. T.C. Bamunuarachchige
B.Sc. (Hons.) (OUSL), Ph.D. (Perad.)

Dr. (Mrs.) Sriyani Wickramasinghe
B.Sc. (Hons) (Colombo), M.Sc. (Colombo), Ph.D. (AIT, Thailand)

Mr. G.G.N. Duminda
B.A. (Kelaniya), M.S.Sc. (Kelaniya), M.Phil. (Perad.)

Dr. Rajnish Vandercone
B.Sc. (Hons) (Perad.), Ph.D. (Washington, USA)

Mrs. P.N. Yapa
B.Sc.(Hons) (Perad.), M.Sc. (Perad.), M.Sc. (Reading, UK), M.Phil. (Perad.)

Dr. K.D.B. Ukuwela
B.Sc. (Hons) (Perad.), Ph.D. (Australia)

Dr. Lalith Senaratna
Grad. I. Chem., M.Med. Sci (Newcastle), Ph.D. (Sydney)

Dr. Manoj S. Fernando
M.B.B.S. (Hons) (Colombo), M.Phil (Colombo)

Lecturers:

Dr. W.M.G.A.S.T.B. Wijetunga
B.Sc. (OUSL), M.Sc. (Perad.), Ph.D. (Vienna)

Mrs. Theja Abayarathna - Study leave
B.Sc. (Hons) (SJP), M.Phil. (SJP)

Mrs. D.K. Hettiarachchi - Study leave
B.Sc. (Hons) (RUSL)

Mr. Ravindra L. Jayaratne
B.Sc.(Hons) (RUSL), M.Sc. (Perad.)

Mrs. H. Parween Reyal - Study leave
B.Sc. (Hons) (RUSL)

Mrs. Prabuddhika H. Kandegedara - Study leave
B.Sc. (Hons) (RUSL)

Mr. K.G.D. De A. Abeysinghe - Study leave
B.Sc. (Hons) (RUSL)

Mr. C. Senevirathne
B.Sc. (Hons) (RUSL)

Mrs. N. Dissanayake
B.Sc. (Hons) (RUSL)

Department of Physical Sciences

Head:

Dr. U. Dahanayake
B.Sc. (Hons) (Perad.), Ph.D. (Perad.), C. Phy.

Senior Lecturers:

Dr. J.L. Ratnasekera - On leave
M.Sc.(Hons) (Moscow), Ph.D. (Moscow)

Mr. A.M. Hafil,
B.Sc. (Perad.), M.Sc. (SJP), M.Phil. (Perad.), C.Chem

Dr. E.M.R.K.B. Edirisinghe
B.Sc. (Hons) (SJP), M.Phil. (SJP), Ph.D. (Greenwich, UK), M.I. Chem. C.

Dr. U. Dahanayake
B.Sc. (Hons) (Perad.), Ph.D. (Perad.), C. Phy.

Dr. Ajith C. Herath
Grad. I. Chem., M.Sc. (Perad.), Ph.D. (Perad.), MRSC

Dr. (Ms.) Harshani O. Wijewardane
B.Sc. (Hons) (Colombo), Ph.D. (Missouri, USA), C. Phy.

Mr. E.M.U.S.B Ekanayaka - Study leave
B.Sc. (Hons) (Perad.), M. Phil. (Japan)

Dr. (Mrs). P.K.Premachandra - On leave
B.Sc. (Perad.), M.Sc. & Ph.D. (Missouri, USA)

Dr. K.G.P.B. Jayathilaka
B.Sc. (Hons) (Perad.), Ph.D. (South Florida)

Mr. K.A.S.H. Kulathilake
B.Sc. (Hons) (SLIIT), MCS (Colombo), SEDA (UK), M.Phil. (Moratuwa)

Lecturers:

Mr. N.S. Weerakoon
B.Sc. (Hons) (Eng.) (Perad.), M.Sc. (Perad.)

Mr. P.S. Palliyaguruge
B.Sc. (Hons) (Perad.), M.Sc. (Perad.)

Mr. N.M.A.P.B. Nilwakke
B.Sc. (Hons) (Perad.), M.Sc. (Perad.)

Mr. M.A.M. Mohammed
B.Sc. (Hons) (Perad.), M.Sc. (India)

Dr. Naleen B. Jayaratna
Grad. I. Chem., M.Sc. (SHSU, USA), Ph.D. (UTA, USA)

Miss. J.S.K.C. Priyangika
B.Sc. (Hons) (Perad.), SEDA (UK), M.Sc. (Moratuwa)

Mr. D.M.R.B.N. Dissanayake - Study leave
B.Sc. (Hons) (RUSL)

Mrs. T.C. Irugalbandara - Study leave
B.Sc. (Hons) (RUSL)

Mr. M.K.D.D. Sandaruwan - Study leave
B.Sc. (Hons) (RUSL)

Ms. Sanchala Abeykoon
B.Sc. (Hons) (Perad.)

Ms. Anupama Gunathilaka
B.Sc. (Hons) (RUSL)

Lecturers in English: Mr. G.A.S.M.P.L. Abeywardena
B.A. (Hons) (RUSL), M.A. (Kelaniya)

Mr. M.D.S.S. Kumara
B.A. (Hons) (RUSL), M.A. (Kelaniya)

2.2.2 ADMINISTRATIVE STAFF OF THE FACULTY

Deputy Registrar: Mr. N.C.S. Senaka
B.Sc. (Kelaniya)

Senior Assistant Librarian: Mrs. K.R.N. Harshani
B.A. (Hons) (Kelaniya), M.S.Sc (Kelaniya) - On leave

2.2.3 VISITING STAFF

1. Prof. Diyanath Samarasingha, Formerly University of Colombo
2. Prof. W.B. Daundasekera, University of Peradeniya
3. Prof. (Mrs.) Nalika Gunawardhena, NPO, World Health Organization
4. Prof. Rohan Weerasuriya, University of Peradeniya
5. Dr. Chaminda Egodawatta, Rajarata University of Sri Lanka
6. Dr. Sarath Amunugama, Deputy Director General, Public Health Services, Ministry of Health
7. Dr. Shantha Fernando, University of Moratuwa
8. Dr. G.I.U.S. Perera, University of Moratuwa
9. Dr. (Mrs.) N.S.R. Hewageegana, University of Peradeniya
10. Dr. Janaka Wijayakulasooriya, University of Peradeniya
11. Dr. Malaka Walpola, University of Moratuwa
12. Dr. A. Ellepola, Teaching Hospital, Anuradhapura
13. Dr. Dilum Bandara, University of Moratuwa
14. Dr. P.M. Wijerathana, Director of Agriculture (former)
15. Dr. G.A.S.M. Ganearachchi, University of Kelaniya
16. Dr. W.A.H.P. Guruge, University of Ruhuna
17. Mr. P.A.C.T. Perera, Manager Ornamental Fish Industry
18. Mr. Shakya Nanayakkara, General Secretary, FISD & Healthy Lanka

19. Mr. R.K.K.M.P. Randeniya, Deputy Director Sri Lanka Bureau of Foreign Employment
20. Mr. P.J. Amarakoon, Former Instructor, Rajarata University of Sri Lanka
21. Dr. Malik Silva, University of Colombo
22. Mr. K.G.T. Jayawardena, CEO, Imaginary Unit, Colombo
23. Dr. S. Sumathipala, University of Moratuwa
24. Dr. A.R. Rupasinghe, Sir Jhon Kothalawala Defence University
25. Dr. (Mrs) Suba Fernando, University of Moratuwa
26. Mr. Chandana Weerasinghe, DMS Electronics
27. Mr. H. Rajakaruna, Rajarata University of Sri Lanka
28. Mr. Y.M.W.G.P.K. Udurawana, Rajarata University of Sri Lanka
29. Mr. P.R. Weerathunga , Rajarata University of Sri Lanka
30. Mr. T.Y. Bandara, Senior Electronics Engineer
31. Mr. J.A.K.N. Jayawardena, Software Engineer
32. Dr. W.P.S.L. Wijesinghe, Institute of Nanotechnology
33. Dr. S.K. Weragoda, Chief Engineer, National Water Supply & Drainage Board
34. Dr. V. Shivakumar, University of Peradeniya
35. Dr. (Ms) L.S. Nawarathne, University of Peradeniya
36. Dr. D.M. Samarathunga, University of Ruhuna
37. Prof. U.N.B. Dissanayake, University of Peradeniya

3. B.Sc. DEGREE PROGRAMMES IN THE FACULTY OF APPLIED SCIENCES

3.1. ADMISSION REQUIREMENTS

Admission of students to the Faculty is done based on an admission policy laid down from time to time by the University Grants Commission with the concurrence of the Government.

3.2. DEGREE PROGRAMMES OFFERED BY THE FACULTY OF APPLIED SCIENCES

At present, the following degree programmes are offered by the FASc.

1. B.Sc. (General) Degree in Applied Sciences
2. B.Sc. **(**Four-year**)** Degree in Applied Sciences
3. B.Sc. **(**Four-year**)** Degree in Industrial Mathematics
4. B.Sc. (Special) Degree in Applied Biology
   (Specialization area I: Biodiversity Conservation)
   (Specialization area II: Fisheries and Aquaculture Management)
   (Specialization area III: Microbiology)
5. B.Sc. (Special) Degree in Chemistry
6. B.Sc. (Joint Major) Degree in Biology and Physics
7. B.Sc. (Joint Major) Degree in Chemistry and Physics
8. B.Sc. (General) Degree in Health Promotion
9. B.Sc. (Special) Degree in Health Promotion
10. B.Sc. (General) Degree in Information & Communication Technology
11. B.Sc. (Four-year) Degree in Information & Communication Technology

N.B. Joint Major Degrees are four-year degree programmes.

3.3. COURSES OF STUDY

B.Sc. (General) Degree Programmes comprise a total of six semesters while the special and four-year B.Sc. Degree Programmes comprise a total of eight semesters, each semester being of 15-week duration.

(*a*) Degree Programmes in Applied Sciences

The programmes of study in Applied Sciences consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory and Optional courses drawn from the subjects of Biology, Botany, Chemistry, Computer Science, Mathematics, Physics and Zoology.

(*b*) Degree Programmes in Information & Communication Technology

The programmes of study in Information Technology consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory courses drawn from the field of study of Information Technology.

(*c*) Degree Programmes in Health Promotion

The programmes of study in Health Promotion consist of

(i) Foundation courses and Interdisciplinary courses

(ii) A combination of Compulsory courses drawn from the field of study of Health Promotion.

Each course is a unit of study normally completed within a semester or an academic year.

A student enrolled for a degree programme in Applied Sciences may select courses from any combination of two or three subjects. The flexibility in selecting the programmes is enhanced by the availability of optional courses.

A student enrolled for a degree programme in Information & Communication Technology or Health Promotion may select courses from the respective field of study.

A student is expected to offer a minimum of 90 credits in order to be eligible to obtain the B.Sc. (General) Degree and a minimum of 120 credits to be eligible for the B.Sc. (Special) and other four-year Degrees offering an average of 30 credits per year including the compulsory courses.

The minimum and maximum numbers of credits a student can offer in an academic year, excluding repeat courses are 26 and 34 respectively. A student has to follow at least 24 credits from a particular subject for him/her to be considered that he/she followed that subject for the degree programme.

3.4. CREDIT RATING

The credit rating is an expression used to denote the "academic value" of a course.

The credit ratings are as follows:

According to the Sri Lanka Qualification Framework, fifty notional learning hours for a taught course, laboratory studies course or field studies is equivalent to one credit and a norm of hundred notional hours for Industrial Training and Research also have the same credit rating. These hours should include the following and all other time spent for the purposes of other modes of learning and examinations.

For courses with lectures only

15 hours of lectures/ tutorials = 1 credit

For courses with laboratory work only

30 – 45 hours of laboratory work = 1 credit

60 – 75 hours of laboratory work = 2 credit

For courses with both lectures and laboratory work only

10 hours of lectures/ tutorials + 15 hours of laboratory work = 1 credit

For courses with field work only

45 hours of field work = 1 credit

Industrial training

2 weeks of industrial training = 1 credit

Research project

1 – 2 weeks of research = 1 credit

N.B. Credits earned by Foundation courses will not be taken in computation of GPA (Non-credit courses).

3.5. DESCRIPTION OF COURSE CODES

Field of Study	Subject	Code	Meaning of the Code
Applied Sciences	Biology	BIO	Biology
	Botany	BOT	Botany
	Zoology	ZOO	Zoology
		BDC	Biodiversity Conservation
		FAM	Fisheries and Aquaculture Management
		MIB	Microbiology
	Chemistry	CHE	Chemistry
	Computer Science	COM	Computer Science
	Mathematics	MAA	Applied Mathematics
		MAP	Pure Mathematics
		MAT	Mathematics
	Physics	PHY	Physics
Health Promotion		HPF	Health Promotion -Field Work
		HPP	Health Promotion - Project
		HPT	Health Promotion -Theory
Information & Communication Technology		ICT	Information & Communication Technology
-	-	FDN	Foundation Course
-	-	IDC	Interdisciplinary Course

Each course is assigned a course code which consists of seven alphanumeric characters as follows:

Course Code consists of three upper case letters space then four digits

First three letters: Field of study/ Subject

- **First digit:** Year of study within the Degree Programme
- **Second digit**: The credit rating
- **Last two-digits:** The serial number of the course

e.g. The course code **CHE 1201** would mean:

CHE => Chemistry **1** => 1st year; **2** => Credit rating of two; **01** => Serial number of the course

Pre-requisites and Co-requisites

Some courses are required to qualify for certain other courses. Such courses are termed as **Pre-Requisites** (PR) and needed to be completed prior to the registration of the more advanced course. The students are required to obtain at least D grades for the courses considered as pre-requisites.

- Some of the pre-requisites are subjects taken for G. C. E. (A/L) Examination.
- Some courses require certain other courses to be taken simultaneously with them.
    - Such courses are called **Co-Requisites** (CR).
    - Practical courses are co-requisites for theory courses and vice-versa.

3.6. FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Foundation Courses (FDNs) and Interdisciplinary Course (IDCs) are designed to bridge gap between the exit at G.C.E. (A/L) and the entry level to a Degree programme and to provide wider knowledge that a student should acquire in general, outside his/ her academic sphere, respectively. A student in **any Degree programme should obtain at least a grade of C for FDNs**. The FDNs and IDCs are given in Table 3.7.1.1. (for Applied Sciences Degree Programmes), in Table 3.7.2.1 for Health Promotion and Table 3.7.3.1 (for Information & Communication Technology Degree programmes).

3.6.1 FOUNDATION (FDN) COURSES (NON-CREDIT COURSES)

3.6.1.1 General English (FDN 1201)

Before the commencement of the academic year for the 1st year students, an intensive course in English, duration of which is 12-16 weeks is conducted by the Faculty. It is compulsory for all the 1st year students to attend these classes regularly. The students are grouped according to their standard of English, which is determined by means of an examination held at the beginning of the course. The students are also tested at the end of the intensive course. All the students are advised to make the maximum use of this course to improve their knowledge of English, as English would be the medium of instruction of all the Degree Programmes. Although this course is delivered in general as mentioned above, the Faculty may decide to conduct the course during the first semester of study.

3.6.1.2 Introduction to Computers (FDN 1202)

This course has been designed in order to prepare the students to be able to use a computer in a modernized office environment. Additionally, this course would serve as a basis for further computer science studies.

3.6.1.3 General Biology (FDN 1203)

This is a compulsory course for those students who have not studied Biology as a subject for their G.C.E. (A/L).

3.6.1.4 Basic Mathematics (FDN 1204)

This is a compulsory course for those students who have not studied Mathematics as a subject for their G.C.E. (A/L).

3.6.2 INTERDISCIPLINARY COURSES (IDC)

Please see tables 3.7.1.1, 3.7.2.1 and 3.7.3.1 for available courses under this category. These courses are not directly related to any single study programme, but are considered as very important in producing a well-rounded graduate. IDCs will be included **if necessary** in the best 90 credits or best 120 credits, depending on his/ her Degree Programme, and hence will be considered for the calculations of the final GPA. Although IDC 1202 - Career Development course is compulsory, it is not used in computation of GPA and minimum C grade is required.

3.7. AVAILABLE COURSES FOR DEGREE PROGRAMMES

3.7.1 DEGREE PROGRAMMES IN APPLIED SCIENCES

Table 3.7.1.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201	2	General English
	FDN 1202	2	Introduction to Computers
	FDN 1203	2	General Biology
	FDN 1204	2	Basic Mathematics
	IDC 1201	2	Philosophy of Science
	IDC 1202	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes
	IDC 2203	2	Principles and Practices of Marketing
Third Year	IDC 3201	2	Entrepreneurship Development
	IDC 3202	2	Standards and Quality Management Systems
Fourth Year	IDC 4201	2	Scientific Communication

N.B. Credit value of FDN courses will not be considered in computation of GPA.

Table 3.7.1.2 COURSES OFFERED BY THE DEPARTMENT OF BIOLOGICAL SCIENCES FOR B.Sc. (GENERAL) DEGREE PROGRAMME

Subject: Biology/ Botany/ Zoology				
Year		**Course Code**	**Course Title**	**Pre-requisite**
First Year	Botany	BOT 1201	Plant Diversity	A/L Biology
		BOT 1202	Functional Plant Anatomy and Wood Science	
	Zoology	ZOO 1201	Invertebrate Diversity	A/L Biology
		ZOO 1302	Vertebrate Diversity	ZOO 1201
		ZOO 1103	Laboratory Techniques in Zoology	
	Biology	BIO 1201	Cell Biology & Biochemistry	A/L Biology
		BIO 1202	Statistical Methods in Biology	
		BIO 1203	General Microbiology	
Second Year	Botany	BOT 2201	Plant Physiology	
		BOT 2202	Plant Pathology	BIO 1201
		BOT 2203	Economic Botany	
	Zoology	ZOO 2201	Animal Histology & Physiology	BIO 1201
		ZOO 2202	General Entomology	ZOO 1201
		ZOO 2203	Animal Behaviour	ZOO 1303, BIO 2302, ZOO 2201
		ZOO 2204	Fish Biology	ZOO 1303
	Biology	BIO 2201	Systematic Biology	
		BIO 2302	Principles of Ecology	BOT 1201, ZOO 1201, ZOO 1303
		BIO 2203	Genetics and Evolution	

Subject: Biology/ Botany/ Zoology/ Biodiversity Conservation/ Fisheries and Aquaculture Management/ Microbiology			
Year	**Course Code**	**Course Title**	**Pre-requisite**
Third Year	BOT 3201	Plant Tissue Culture	
	BOT 3202	Principles and Practice of Horticulture and Landscaping	
	BOT 3203	Postharvest Technology of Plant Products	BOT 2204
	BOT 3204	Flora of Sri Lanka	
	ZOO 3201	Medical Entomology	ZOO 2202
	ZOO 3202	Applied Parasitology	ZOO 1201
	ZOO 3203	Economic Entomology	ZOO 2202
	ZOO 3204	Embryology and Developmental Biology	BIO 2203, ZOO 2201
	BIO 3201	Molecular Biology	BIO 2203
	BIO 3102	Ecotourism	BIO 2302
	BIO 3203	Environmental Pollution	BIO 2302
	BIO 3204	Bioinformatics **	BIO 2203, BIO 3201
	BIO 3205	Ecotoxicology **	BIO 2302
	BIO 3206	Experimental Design and Nonparametric Methods in Statistics	BIO 1202
	BIO 3207	Field Project	BIO 1201, BIO 3206
	BDC 3301	Concepts of Biodiversity Conservation	BIO 2302
	BDC 3202	Environmental Impact and Risk Assessment	
	BDC 3203	Introduction to Geographical Information Systems **	
	BDC 3204	Wildlife Conservation and Management	BIO 2302
	FAM 3201	Fisheries and Aquaculture	
	FAM 3202	Breeding Techniques in Aquaculture	
	FAM 3303	Ornamental Fish Industry **	
	MIB 3201	Industrial Microbiology	
	MIB 3202	Soil Microbiology **	
	MIB 3203	Virology **	
	MIB 3204	Food Microbiology	BIO 1203
	MIB 3205	Plant-Microbe Interactions **	
	MIB 3206	Analytical Techniques in Molecular Biology**	
	MIB 3207	Immunology **	
	MIB 3208	Environmental Microbiology **	

**** Only for Special degree programmes (compulsory).**

Table 3.7.1.3 COURSES OFFERED BY DEPARTMENT OF PHYSICAL SCIENCES FOR B.SC. (GENERAL) DEGREE PROGRAMME

Subject: Chemistry				
Year	**Course Code**	**Course Title**	**Pre-requisite**	**Co-requisite**
First Year	CHE 1201	General Chemistry	A/L Chemistry	CHE 1104 * CHE 1105 *
	CHE 1302	Physical Chemistry I		
	CHE 1203	Organic Chemistry I		
	CHE 1104	Inorganic Chemistry − Laboratory		
	CHE 1105	Organic Chemistry − Laboratory		
Second Year	CHE 2201	Physical Chemistry II	CHE 1202, CHE 1104, CHE 1105	CHE 2107 * CHE 2108 *
	CHE 2202	Organic Chemistry II	CHE 1203, CHE 1105, CHE 1105	
	CHE 2103	Analytical Chemistry	CHE 1204	
	CHE 2104	Introduction to Biochemistry	1st year Chemistry courses	
	CHE 2205	Inorganic Chemistry	CHE 1201, CHE 1204	
	CHE 2106	Spectroscopic Methods in Organic Chemistry	CHE 1203, CHE 1204	
	CHE 2107	Organic Chemistry − Laboratory	CHE 1104, CHE 1105	
	CHE 2108	Physical Chemistry − Laboratory	CHE 1104, CHE 1105	
Third Year	CHE 3201	Industrial Inorganic Materials	CHE 1201, CHE 2201	
	CHE 3202	Advanced Biochemistry **	1st and 2nd years Chemistry	
	CHE 3203	Chemistry of Polymers	1st year Chemistry	
	CHE 3204	Food Chemistry	CHE 1203, CHE 2202	
	CHE 3205	Advanced Inorganic Chemistry I **	1st and 2nd years Chemistry	
	CHE 3206	Chemical and Process Technology	CHE 1202, CHE 2201	
	CHE 3207	Electrochemistry	CHE 1302	
	CHE 3208	Environmental Chemistry	1st year Chemistry	
	CHE 3209	Natural Products Chemistry	CHE 2202	
	CHE 3210	Research Project	1st and 2nd years Chemistry	
	CHE 3311	Advanced Analytical Chemistry	CHE 2103, CHE 2106	
	CHE 3213	Industrial Chemistry	1st and 2nd years Chemistry	
	CHE 3214	Chemistry – Laboratory	1st and 2nd years Chemistry	
	CHE 3215	Heterocyclic and Synthetic Organic Chemistry**	1st and 2nd years Chemistry	
	CHE 3216	Advanced Analytical and Environmental Chemistry – Laboratory**	1st and 2nd years Chemistry	
	CHE 3217	Advanced Inorganic Chemistry − Laboratory **	1st and 2nd years Chemistry	
	CHE 3218	Advanced Organic Chemistry − Laboratory **	1st and 2nd years Chemistry	
	CHE 3219	Advanced Physical Chemistry − Laboratory **	1st and 2nd years Chemistry	
	CHE 3120	Calculations in Chemistry	1st and 2nd years Chemistry	
	CHE 3121	Industrial Training **	1st and 2nd years Chemistry	
	CHE 3222	Electronics and IT for Chemists **/***	1st and 2nd years Chemistry	

***This Co-requisite is only for students those who follow Chemistry as a subject**

**** Offered only for the students in the Chemistry Special Degree programme**

***** Offered only for the students in the Joint Major & Applied Science (4 Year) Degree programmes**

Subject: Physics				
Year	**Course Code**	**Course Title**	**Pre-requisite**	**Co-requisite**
First Year	PHY 1201	General Physics	A/L Physics or FDN 1204	PHY 1205**
	PHY 1102	Waves and Vibrations		
	PHY 1203	Fundamentals of Electromagnetism		
	PHY 1104	Modern Physics		
	PHY 1205	Practical Unit		
Second Year	PHY 2101	Thermodynamics & Radiation	A/L Physics or PHY 1201	PHY 2207**
	PHY 2102	Electromagnetism	A/L Physics, PHY 1203	
	PHY 2103	Electronics I		
	PHY 2204	Physical Optics	PHY 1102	
	PHY 2105	Quantum Mechanics	A/L Physics or FDN 1204	
	PHY 2106	Atomic & Nuclear Physics	PHY 1104 or FDN 1204	
	PHY 2207	Practical Unit	A/L Physics, PHY 1205	
Third Year	PHY 3301	Atmospheric Physics	PHY 2101	
	PHY 3302	Mathematical Methods for Physicists	A/L Physics or FDN 1204	
	PHY 3203	Physical Oceanography	PHY 1102, PHY 2101	
	PHY 3204	Applied Geophysics	1st year Physics courses	
	PHY 3105	Physical Geology	PHY 1102	
	PHY 3206	Soil Physics	PHY 1201, PHY 2101	
	PHY 3207	Energy Resources	PHY 2103, PHY 2106	
	PHY 3208	Project/ Seminar	Any course offered in the 3rd year	
	PHY 3209	Solid State Physics	1st and 2nd year Physics courses	
	PHY 3210	Properties of Materials	PHY 3209	
	PHY 3311	Medical Physics	PHY 1104, PHY 2105	
	PHY 3212	Electronics II	PHY 2103	
	PHY 3213	The Curved Space Times of General Relativity	1st and 2nd year Physics courses	
	PHY 3214	Graphical Programming for Physics	1st and 2nd year Physics courses	
	PHY 3215	Practical Unit	PHY 1205, PHY 2207	

****This Co-requisite is only for students those who follow Physics as a subject**

Subject: Computer Science				
Year	**Course Code**	**Course Title**	**Pre-requisite**	**Co-requisite**
First Year	COM 1201	Principles of Programme Design		
	COM 1302	Database Management Systems		
	COM 1305	Object Oriented Programming	COM 1201	
	COM 1407	Computer Programming	COM 1201	
	COM 1308	Digital Logic Design		
Second Year	COM 2301	Systems Analysis and Design	COM 1302	
	COM 2303	Web Design	COM 1201, COM 1302	
	COM 2304	Computer Graphics and Image Processing	A/L Combined Mathematics or FDN 1204	
	COM 2307	Data Structures and Algorithms	COM 1201, COM 1407	
	COM 2308	Software Engineering	COM 1305, COM 2301	
Third Year	COM 3401	Data Communication and Networking	COM 2307	
	COM 3303	Artificial Intelligence	COM 2307	
	COM 3204	Information Security	A/L Combined Mathematics, or FDN 1204, COM 2307	
	COM 3405	Research Project	All CS compulsory courses up to 2nd Year	
	COM 3306	Operating Systems	COM 2307	
	COM 3307	Embedded systems	COM 1407, COM 1308	COM3306

Subject: Mathematics				
Year		**Course Code**	**Course Title**	**Pre-requisites**
First Year	Pure Mathematics	MAP 1301	Linear Algebra	A/L Combined Mathematics
		MAP 1302	Differential Equations I	
		MAP 1203	Real Analysis I	
	Applied Mathematics	MAA 1201	Mathematical Methods I	A/L Combined Mathematics
		MAA 1302	Probability & Statistics I	
		MAA 1203	Numerical Analysis I	A/L Combined Mathematics
		MAA 1104	Mathematical Modelling	
Second Year	Pure Mathematics	MAP 2301	Algebra	MAP 1301
		MAP 2202	Real Analysis II	MAP 1203
		MAP 2203	Differential Equations II	MAP 1302
		MAP 2204	Complex Calculus	MAP 1203
	Applied Mathematics	MAA 2201	Mathematical Methods II	MAA 1201
		MAA 2302	Probability & Statistics II	MAA 1302
		MAA 2203	Numerical Analysis II	MAA 1203
		MAA 2204	Linear Programming	A/L Combined Mathematics
Third Year	Financial Mathematics	MAT 3301	Advanced Linear Programming	MAA 2204
		MAT 3302	Network Optimization	
		MAT 3203	Regression Analysis	MAA 2302
		MAT 3204	Index Numbers	
		MAT 3205	Introduction to Statistical Decision Theory	MAA 1302
		MAT 3206	Data Analysis Using a Computer Software	MAA 1302 or BIO 1202
		MAT 3307	Project	
		MAT 3208	Time Series	MAA 2302
		MAT 3209	Statistical Computing using software	MAA 1302 or BIO 1202
	Industrial Mathematics	MAT 3301	Advanced Linear Programming	MAA 2204
		MAT 3302	Network Optimization	
		MAT 3203	Regression Analysis	MAA 2302
		MAT 3205	Introduction to Statistical Decision Theory	MAA 1302
		MAT 3206	Data Analysis Using a Computer Software	MAA 1302 or BIO 1202
		MAT 3307	Project	
		MAT 3208	Time Series	MAA 2302
		MAT 3209	Statistical Computing using software	MAA 1302 or BIO 1202
		MAT 3310	Integer Programming	MAT 3301
		MAT 3312	Statistical Quality Control	MAA 2302
		MAT 3213	Graph Theory	
		MAT 3214	Applied Statistics	MAA 2302
		MAT 3217	Non-Linear Programming	MAA 2204
		MAT 3319	Fluid Dynamics I	MAA 2201

FOURTH YEAR PROGRAMME OF STUDY

Table 3.7.1.4 FOURTH YEAR COURSES OFFERED BY DEPARTMENT OF BIOLOGICAL SCIENCES

Specialization area I: Biodiversity Conservation	
Course Code	**Course Title**
BDC 4201	Environmental Policies and Management
BDC 4202	Wetland Conservation and Management
BDC 4203	Forest Conservation
BDC 4204	Advanced Geographical Information Systems
BDC 4205	Economics of Biodiversity
BDC 4206	Limnology and Conservation of Aquatic Resources
BDC 4207	Coastal and Marine Biodiversity Conservation
BDC 4208	Current Topics in Biodiversity Conservation
BDC 4209	In-plant Training
BDC 4810	Research Project
Specialization area II: Fisheries and Aquaculture Management	
Course Code	**Course Title**
FAM 4201	Fishery Resources Management
FAM 4202	Aquaculture Engineering
FAM 4203	Aquafarming of Macrophytes
FAM 4204	Fish Nutrition and Growth
FAM 4205	Fish Health Management
FAM 4206	Postharvest Techniques in Fisheries
FAM 4207	Fishery Socioeconomics
FAM 4208	Current Topics in Fisheries and Aquaculture Management
FAM 4209	In plant Training
FAM 4810	Research Project
Specialization area III: Microbiology	
Course Code	**Course Title**
MIB 4201	Applied Mycology
MIB 4202	Medical Microbiology
MIB 4103	Molecular Microbiology
MIB 4204	Microbial Taxonomy
MIB 4205	Techniques and Strategies in Molecular Biology
MIB 4206	Molecular Biotechnology
MIB 4207	Microbial Genetics
MIB 4208	Current Topics in Microbiology
MIB 4209	In-plant Training
MIB 4810	Research Project

Table 3.7.1.5 FOURTH YEAR COURSES OFFERED BY DEPARTMENT OF PHYSICAL SCIENCES

Subject: Chemistry		
Course Code	**Course Title**	**Pre-requisites**
CHE 4201	Computational Chemistry ** / ***	All Chemistry courses in 1st year and 2nd year
CHE 4202	Advanced Physical Chemistry I ** / *** (*CHE 3207 is a pre-requisite*)	
CHE 4203	Surface and Colloidal Chemistry ** / ***	
CHE 4204	Advanced Inorganic Chemistry II **	
CHE 4605	Research Project ***	
CHE 4206	Nanochemistry ** / ***	
CHE 4307	Advanced Physical Chemistry II **	
CHE 4308	Advanced Environmental Chemistry ** / *** (*CHE 3208 is a pre-requisite*)	
CHE 4309	Advanced Organic Chemistry **	
CHE 4210	Molecular and Surface Spectroscopy ** / ***	
CHE 4212	Pharmaceutical and Medicinal Chemistry ** / ***	
CHE 4213	Chemical Toxicology ** / ***	
CHE 4814	Research Project and Seminars **	
CHE 4215	Solid State Chemistry **	
**** Only for the Chemistry Special Degree Programme** ***** Only for the Joint Major & Applied Science (4 Year) Degree programmes**		
Subject: Computer Science		
Course Code	**Course Title**	**Pre-requisites**
COM 4201	Introduction to Mobile Computing	COM 1407, COM 1302, COM 1305
COM 4202	Bioinformatics and Computational Biology	COM 1407
COM 4203	Geographical Information System	COM 1407, COM 1302
COM 4604	Research Project	COM 3405
ICT 4201	ICT for Education	COM 2303
ICT 4302	Intelligent Systems	COM 3303
ICT 4303	Advanced Computer Networks	COM 2307, COM 3401
ICT 4305	Parallel and Cluster Computing	COM 3306
ICT 4306	E Commerce	COM 2303, COM 3204
Subject: Mathematics		
Industrial Mathematics		
Course Code	**Course Title**	**Pre-requisite**
MAT 4301	Operational Research I	MAA 2204
MAT 4302	Financial Mathematics	
MAT 4303	Dynamic Programming	MAA 2204
MAT 4304	Operational Research II	MAA 2204
MAT 4305	Stochastic Processes	MAA 2302, MAT 3214
MAT 4306	Optimization Modelling	MAT 3301
MAT 4307	Design of Experiments	MAT 3203, MAT 3214
MAT 4608	Project Work	
MAT 4309	Combinatorics	MAT 3213
MAT 4310	Computational Mathematics	MAA 1203, MAA 2203

Subject: Physics		
Course Code	**Course Title**	**Pre-requisite**
PHY 4201	Biophysics	1st and 2nd year Physics
PHY 4202	The Curved Space Times of General Relativity	
PHY 4203	Classical Mechanics	PHY 1201, PHY 3302
PHY 4204	Current Topics in Biophysics	
PHY 4205	Seminar in Biophysics	
PHY 4606	Project in Biophysics	
PHY 4308	Characterization Techniques	PHY 3209, PHY3210
PHY 4209	Physics of Semiconductor Devices	PHY 2103, PHY 2105, PHY 3207
PHY 4210	Advanced Quantum Mechanics	PHY 2105
PHY 4211	Nanomaterials and Nanotechnology	PHY 2105
PHY 4212	Statistical Thermodynamics	1st and 2nd year Physics
PHY 4613	Research Project	
PHY 4214	Current Topics in Chemistry and Physics	
PHY 4217	Advanced Energy Resources	

N.B. ***(1) The minimum and maximum numbers of credits a student can offer in an academic year, excluding repeat courses are 26 and 34, respectively.***

(2) A student has to follow at least 24 credits including compulsory courses from a particular subject for him/ her to be considered that he/ she followed that subject for the degree programme.

(3) The availability of a particular course in a particular year will depend on the number of applicants (minimum No.05) as well as the availability of lecturers.

3.7.2 DEGREE PROGRAMMES IN HEALTH PROMOTION

Table 3.7.2.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201	0	General English
	FDN 1202	0	Introduction to Computers
	FDN 1204	0	Basic Mathematics
	IDC 1201	2	Philosophy of Science
	IDC 1202	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes

N.B. Credit value of FDN courses will not be considered in computation of GPA.

Table 3.7.2.2 COURSES OFFERED BY THE DEPARTMENT OF BIOLOGICAL SCIENCES FOR THE DEGREE PROGRAMMES IN HEALTH PROMOTION

Field of study: Health Promotion

First Year

Course Code	Credit Rating	Course Title
HPT 1201	2	Basic Physiology
HPT 1202	2	Introduction to Human Diseases & Health
HPT 1103	1	Concepts of Health
HPT 1104	1	History and Evolution of Health Promotion
HPT 1105	1	Introduction to Mass Communication
HPT 1206	2	Nutrition and Metabolism
HPT 1107	1	Reproductive Physiology & Developmental Biology
HPT 1208	2	Principles, Strategies and Practices in Health Promotion
HPT 1209	2	Measures of Health
HPT 1210	2	Research Methods
BIO 1201	2	Cell Biology & Biochemistry
BIO 1202	2	Statistical Methods in Biology
HPF 1101	1	Devising Applicable Measures of Individual and Group Health
HPF 1102	1	Measuring Health Status of a Student Group
HPF 1203	2	Activities to Improve Health of a Student Group

Second Year

Course Code	Credit Rating	Course title
HPT 2301	3	Psychology and Human Behaviour
HPT 2202	2	Working with Communities
HPT 2103	1	Principles of Evaluation
HPT 2104	1	Introduction to Epidemiology
HPT 2205	2	Structural Determinants of Health
HPT 2206	2	Indicators and Measurements of Community Health
HPT 2207	2	Health Improvement
HPT 2208	2	Early Childhood Care and Development (ECCD) &Maternal and Child Health (MCH)
BIO 2204	2	Ecology

HPF 2201	2	Applying Measures to Improve Health Status of Student Groups
HPF 2102	1	Introduction to Field Settings
HPF 2103	1	Engagement of Communities
HPF 2204	2	Clarifying Health Issues with Assigned Communities
HPF 2105	1	Devising Measures of Health in Partnerships with Communities
HPF 2106	1	Assessing Changes in Health Status of Student Groups
HPF 2207	2	Clarifying Structural Determinants of Health with Communities
HPF 2208	2	Engaging Structural Determinants of Health of Communities
HPF 2109	1	Monitoring Progress of Communities
HPF 2110	1	Clarifying Obstacles to Progress with Communities

Third Year

Course Code	Credit Rating	Course title
HPT 3301	3	Family and Community Health Promotion
HPT 3202	2	Commercial Influences on Health
HPT 3203	2	Social Structure and Social Influence
HPT 3104	1	Philosophical and Ethical Issues in Health Education and Promotion
HPT 3205	2	Healthy Public Policy & Legislation
HPT 3306	3	Report Writing, Assessing and Scientific Communication
HPT 3107	1	Future Directions
HPT 3108	1	Leadership
HPT 3309	3	The Sri Lankan Setting
BIO 3203	2	Environmental Pollution
HPF 3101	1	Reporting Health Changes in Student Groups
HPF 3302	3	Addressing Obstacles to Progress with Communities
HPF 3103	1	Reviewing Progress with Communities and Redirecting Efforts
HPF 3204	2	Evaluation of Progress
HPF 3205	2	Final Evaluation of Field Settings
HPF 3206	2	Report Writing
HPF 3207	2	Follow Up and Continuing Contact with Communities

Fourth Year

Course Code	Credit Rating	Course title
HPT 4501	5	Child Well-being and Development
HPT 4202	2	Reduction of Spread of Sexually Transmitted Diseases
HPT 4503	5	Reduction of Tobacco, Alcohol and Other Drug Related Harm
HPT 4204	2	Reduction of Suicide
HPP 4801	8	Project (Part I)
HPP 4802	8	Project (Part II)

3.7.3 DEGREE PROGRAMES IN INFORMATION TECHNOLOGY

Table 3.7.3.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

Year	Course Code	Credit Rating	Course Title
First Year	FDN 1201	2	General English
	FDN 1203	2	General Biology
	FDN 1306	3	Basic Mathematics for non-Mathematics Students
	FDN 1205	2	Basic Science for Non-Science Students
	IDC 1201	2	Philosophy of Science
	IDC 1202	2	Career Development
Second Year	IDC 2201	2	English for Professional Purposes
	IDC 2203	2	Principles and Practices of Marketing
Third Year	IDC 3201	2	Entrepreneurship Development
	IDC 3202	2	Standards and Quality Management Systems

N.B. Credit value of FDN courses will not be considered in computation of GPA.

Table 3.7.3.2 COURSES OFFERED BY THE DEPARTMENT OF PHYSICAL SCIENCES FOR DEGREE PROGRAMMES IN INFORMATION TECHNOLOGY

First Year Compulsory Courses

Course Code	Credit Rating	Course Title
ICT 1201	2	Fundamentals of Computer Systems
ICT 1402	4	Principles of Programme Design and Programming
ICT 1303	3	Basic Electronics and Digital Logic Design
ICT 1404	4	Mathematics and Statistics for Computing
ICT 1305	3	Data Structures
ICT 1306	3	Object Oriented Programming
ICT 1407	4	Database Systems
ICT 1308	3	Operating Systems

Second Year Compulsory Courses

Course Code	Credit Rating	Course title
ICT 2301	3	Design and Analysis of Algorithms
ICT 2402	4	Software Engineering
ICT 2403	4	Graphics and Image Processing
ICT 2404	4	Multimedia and Web Technology
ICT 2305	3	Computer Networks
ICT 2406	4	Internet Programming
ICT 2207	2	Management Information Systems
ICT 2408	4	Computer Organization and Architecture
ICT 2209	2	Communication Skills

Third Year Compulsory Courses

Course Code	Credit Rating	Course title
ICT 3301	3	Human Computer Interaction
ICT 3202	2	Operational Research
ICT 3303	3	Information Systems Security
ICT 3304	3	Embedded Systems
ICT 3205	2	Information Technology Project Management
ICT 3207	2	Professional Practice and Ethics
ICT 3208	2	Entrepreneurship
ICT 3209	2	Principles of Accounting
ICT 3411	4	Group Project

Third Year Optional Courses

Course Code	Credit Rating	Course title
ICT 3209	2	Principles of Accounting
ICT 3212	2	Introduction to Intelligent Systems
ICT 3213	2	Advanced Operating Systems

N.B. Students who wish to proceed to fourth year programme are required to follow ICT 3212

Fourth Year Compulsory Courses

Course Code	Credit Rating	Course title
ICT 4201	2	ICT for Education
ICT 4302	3	Intelligent Systems
ICT 4303	3	Advanced Computer Networks
ICT 4204	2	Mobile Computing
ICT 4305	3	Parallel and Cluster Computing
ICT 4306	3	E-Commerce
ICT 4307	3	Bio Informatics and Computational Biology
ICT 4208	2	Geographic Information Systems
ICT 4609	6	Individual Research Project
ICT 4410	4	Industrial Training

3.8. ASSESSMENT

3.8.1 METHODS OF ASSESSMENT

The knowledge and skills of a student in a course will be assessed throughout the semester as well as at the end of each semester by means of

- Continuous Assessments,
- End semester Examination,
- Evaluation of Reports, Dissertations and Presentations, etc.

Weightage given to each assessment component will be announced at the beginning of the course.

Continuous Assessments

Marks obtained for mid semester examination/ tutorials/ spot tests/ practical sessions/ assignments/ quizzes/ records/ reports/ presentations, etc. will be taken into account in the determination of the final grade, depending on the requirements of each course.

End Semester Examination:

A student will be assessed at the end of each semester either by a theory paper or a practical examination or both, depending on the course. The duration of each end of semester theory examination will be as follows:

- For a one credit - a minimum of one hour or one and half hour paper
- For a two credit - a two-hour paper
- For a three credit - a two and half or three-hour paper
- For a course of more than three credits - a three-hour paper or two papers of two-hour duration

The duration of each end of semester practical examination will be notified by the respective Department at the beginning of the semester.

IMPORTANT

Students are required to satisfy 80% of attendance in lectures/ practical classes/ tutorials to qualify for the end of semester examination.

A student should sit all the examinations of all the courses for which he/ she has registered at the beginning of each semester. A sitting any examination after the relevant semester to which the student ought to get registered for, shall not be considered as first attempt, unless the consent of the Faculty Board for such postponement has been obtained.

A student who obtained the consent of the Faculty Board for the said postponement should appear at the immediate available end semester examination.

3.8.2 GRADING SYSTEM

Grade	Grade Point Value
A^+	4.0
A	4.0
A^-	3.7
B^+	3.3
B	3.0
B^-	2.7
C^+	2.3
C	2.0
C^-	1.7
D^+	1.3
D	1.0
E	0.0

3.8.3 GRADE POINT AVERAGE

Grade Point Average (GPA) is the credit-weighted arithmetic mean of the Grade Point Values, i.e. the GPA is determined by dividing the total credit-weighted Grade Point Value by the total number of credits.

$$GPA = \frac{\sum(\text{Grade point value of a course unit} \times \text{number of creidts of that course unit})}{Total\ number\ of\ credits}$$

For example, a student who completed three courses of three credits each, two courses of two credits each and two courses of one credit each with grades A^+, B, D, C^+, E, B^+ and C respectively would have a GPA of

$$\frac{4.0\times3+\ 3.0\times3+\ 1.0\times3+\ 2.3\times2+0.0\times2+3.3\times1+\ 2.0\times1}{3+3+3+2+2\ +1+1} = \frac{33.9}{15} = 2.26$$

(Truncated to two decimal places without rounding)

3.8.4 PRE-REQUISITES

The students are required to obtain **at least D grades** for the courses considered as pre-requisites.

3.8.5 REFERRED STUDENTS

A student who obtains a grade below C in a particular course may re-sit the examination in respect of that course for the purpose of improving the grade; the best grade obtainable in this instance is C. In the event a student obtains a lower grade while attempting to better the grade, he/she will be entitled to the previous grade.

3.9. DEGREE AWARDING CRITERIA

3.9.1 B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES

To be eligible for the B.Sc. (General) degree in Applied Sciences, a student should offer a minimum of **90 credits**, with at least **26 credits** per each academic year. In case where a student has accumulated more than **90 credits,** the courses corresponding to the best **90** credits will be considered. In cases where the total number of credits does not add exactly to **90,** the best **91-93** credits may be considered.

N.B. All courses specified as compulsory for a subject are included in the best 90 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of 2.00,
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **69 credits,** with **at least 22 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and
iv. complete the relevant requirements within a period of six academic years.

Guidelines for the selection of courses in the B. Sc. (General) Degree in Applied Sciences are given in the Tables in section 5.

Award of Classes

N.B. A student has to complete all the requirements given in section 3.9.1. to be considered for the award of Class.

First Class

A student may be awarded First Class provided he/she,

i. obtains a minimum Grade Point Average of **3.70** and
ii. obtains grades of C or better in the specified courses aggregating to at least **90 credits** within three academic years.

Second Class (Upper Division)

A student may be awarded Second Class (Upper Division) provided him/her,

i. obtains a minimum Grade Point Average of **3.30** and
ii. obtains grades of C or better in the specified courses aggregating to at least **85 credits** and grades of at least D in the remaining courses within three academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided him/her,

i. obtains a minimum Grade Point Average of **3.00** and
ii. obtains grades of C or better in the specified courses aggregating to at least **80 credits** and grades of at least D in the remaining courses within four academic years.

3.9.2 B.Sc. (SPECIAL) DEGREE IN APPLIED BIOLOGY

- **Specialization Area I : Biodiversity and Conservation**
- **Specialization Area II : Fisheries and Aquaculture Management**
- **Specialization Area III : Microbiology**

3.9.2.1 Selection of Students

At the end of their third semester, students may apply to follow a Special Degree Programme offered by the Department of Biological Sciences. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

The number of places available in each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc. The students who are selected to follow the Special Degree Programme will study for a total period of four academic years.

The minimum requirements for applying for the Special Degree Programme are as follows:

(*a*) A student should have obtained a Grade Point Average of 3.00, for all the compulsory courses for Botany and Zoology or Biology.

(*b*) The best 45 credits including all the compulsory courses accumulated during the first three semesters should not include more than 6 credits with D grades and any credit with an E grade**.**

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.2.2 Course structure of the Special Degree Programme

During the first two years, a student should accumulate a minimum of 52 credits of which not less than 21credits should be in Botany and Zoology or Biology. By the end of the third year a student should have accumulated a minimum of 42 credits in the area of specialization. During the fourth year, the student should accumulate a minimum of 30 credits in the area of specialization.

During the fourth year, a special degree student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses in the B. Sc. (Special) Degree in Applied Biology are given in the Tables in sections 5.2.

3.9.2.3 Option of reverting to the General Degree

A student reading for a B.Sc. (Special) Degree may request the award of the B.Sc. (General) Degree foregoing the special degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.2.4 B.Sc. (Special) Degree – Awarding Criteria

To be eligible for the B.Sc. (Special) Degree, a student should offer a minimum of **120 credits**, with at least **26 credits** per academic year and with not less than **72 credits** in the area of specialization. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123 credits** may be considered.

N.B. All courses specified as compulsory by a student's* area of specialization *are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**

ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses,

iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and

iv. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete all the requirements given in section 3.9.2.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided him/her

i. obtains a minimum GPA **3.00**and
ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years.

3.9.3 B.Sc. (FOUR-YEAR) DEGREE IN APPLIED SCIENCES

3.9.3.1 Selection of Students

This option is for third year students to pursue an additional year of study. The minimum requirements for applying for the four year degree programme are as follows:

(*a*) A student should have obtained a Grade Point Average of 3.00 for 65 credits accumulated during the first five semesters, including all the compulsory courses stipulated by the intended study programme.

(*b*) The best 65 credits accumulated during the first five semesters should not include more than 8 credits with D grades and any credit with an E grade**.**

At the end of their fifth semester, students may apply to follow the four year degree programme in Applied Sciences. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

The number of places available each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc.

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.3.2 Course Structure

A student enrolled for a degree programme in Applied Sciences may select courses from any combination of two or three subjects, provided that he/she offers an average of 30 credits per year including the compulsory courses. On this basis, the student has the flexibility of formulating his/her own programme of study and is expected to offer a minimum of 120 credits to be eligible for the B.Sc. (four-year) Degree in Applied Sciences. During the fourth year, a student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

The fourth year will consist of lectures/ practical classes/ industrial training/ mini projects etc.

Guidelines for the selection of fourth year courses in the B.Sc. (Four-year) Degree in Applied Sciences is given in Table 5.3.1.

3.9.3.3 Option of reverting to the General Degree

A student reading for a B.Sc. (Four-year) degree in Applied Sciences may request the award of the B.Sc. (General) Degree foregoing the four-year degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.3.4 B.Sc. (Four-year) Degree in Applied Sciences – Awarding Criteria

To be eligible for the B.Sc. (Four-year) Degree in Applied Sciences, a student should offer a minimum of 120 credits, with at least 26 credits per academic year including the compulsory courses. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120** credits will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. All courses specified as compulsory by a student's subjects are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and
iv. complete the relevant requirements within a period of 6 academic years.

Award of Class

N.B. A student has to complete the requirements given in section 3.9.3.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided he/ she

i. obtains a minimum GPA **3.00**and
ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years

3.9.4 B.Sc. (JOINT MAJOR) DEGREES

3.9.4.1 Selection of Students

At the end of their third semester, students may apply to follow a Joint Major Degree Programmes offered by Departments. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

The number of places available in each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc. The students who are selected to follow the Joint Major Degree Programme will study for a total period of four academic years.

The degrees involve specialization in two different areas *viz.* Biology &Physics, and Chemistry & Physics will be offered as B.Sc. (Joint Major) Degrees. The selection would be at the end of second year based on the results of three semesters.

The minimum requirements for applying for the B.Sc. (Joint Major) Degree Programme are as follows:

a) A minimum of 2.90 GPA should be obtained for the courses offered during first 3 semesters in Physics and Biology or Chemistry.
b) The best 45 credits including all compulsory courses accumulated during the first three semesters should not include more than 6 credits with D grades and any credit with an E grade**.**

A total of 120 credits would be required to qualify for the degree over a four-year period and of this, a minimum of 45 credits must be in each of the two subject areas (90 credits in the two subjects). A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board.

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.4.2 Course Structure

Guidelines for the selection of courses in the Joint Major Degree in Chemistry and Physics are given in the Table 5.4.1.

Guidelines for the selection of courses in the Joint Major Degree in Biology and Physics are given in the Table 5.5.1.

During the fourth year, a degree student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

3.9.4.3 Option of reverting to the General Degree

A student reading for a B.Sc. (Joint Major) Degree may request the award of the B.Sc. (General) Degree foregoing the Joint Major Degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.4.4 B.Sc. (Joint Major) Degree – Awarding Criteria

To be eligible for the B.Sc. (Joint Major) Degree, a student should offer a minimum of 120 credits, with at least 26 credits per academic year. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120** credits will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. All courses specified as compulsory by a student's subjects are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and
iv. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete the requirements given in section 3.9.4.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided he/ she

i. obtains a minimum GPA **3.00** and
ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years

3.9.5 B.Sc. (FOUR-YEAR) DEGREE IN INDUSTRIAL MATHEMATICS

3.9.5.1 Selection of Students

This degree would offer an extra year to third year degree students who follow Mathematics to change to a four-year degree programme. The minimum requirements for applying for the degree programme are as follows:

(*a*) A student should have obtained a Grade Point Average of 3.00 for 65 credits accumulated during the first five semesters, including all the compulsory courses stipulated by the intended study programme.

(*b*) The best 65 credits accumulated during the first five semesters should not include more than 8 credits with D grades and any credit with an E grade**.**

At the end of their fifth semester, students may apply to follow the Four Year Degree Programme in Industrial Mathematics. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.5.2 Course Structure

A total of 120 credits would be required to qualify for the degree over a four-year period, out of which a minimum of 72 credits should be in the subject/ disciplines. The fourth year will consist of lectures/ practical classes/ industrial training/ mini Projects etc

Guidelines for the selection of courses in the B. Sc. (Four-year) degree in Industrial Mathematics are given in the Table 5.6.1.

During the fourth year, a student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year

3.9.5.3 Option of reverting to the General Degree

A student reading for a B.Sc. (Four-year) degree in Industrial Mathematics may request the award of the B.Sc. (General) Degree foregoing the four-year degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.5.4 B.Sc. (Four-year) Degree in Industrial Mathematics – Awarding Criteria

To be eligible for the B.Sc. (Four-year) Degree in Industrial Mathematics, a student should offer a minimum of 120 credits, with at least 26 credits per academic year. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120 credits** will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. that all courses specified as compulsory by a student's subject/disciplines are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**

ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses

iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and

iv. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete the requirements given in section 3.9.5.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and

ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and

ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided he/ she

i. obtains a minimum GPA **3.00** and

ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years

3.9.6 B.Sc. (GENERAL) DEGREE IN INFORMATION & COMMUNICATION TECHNOLOGY

To be eligible for the B.Sc. (General) degree in Information Technology, a student should offer a minimum of **90 credits**, with at least **26 credits** per each academic year. In a case where a student has accumulated more than **90 credits,** the courses corresponding to the best **90** credits will be considered. In cases where the total number of credits does not add exactly to **90,** the best **91-93** credits may be considered.

N.B. All courses specified as compulsory in the field of study are included in the best 90 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the compulsory courses in the field of study aggregating to a minimum of **69 credits,** with **at least 22 credits per each academic year**, and at least grades of D in the remaining courses
iii. obtain a grade of C or better for the ICT 3411 course unit
iv. obtain at least **C grades** for the Foundation Courses given in Table 3.7.3.1 and
v. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete all the requirements given in section 3.9.6 to be considered for the award of Class.

First Class

A student may be awarded First Class provided he/she,

i. obtains a minimum Grade Point Average of **3.70** and
ii. obtains grades of C or better in the specified courses aggregating to at least **90 credits** within three academic years

Second Class (Upper Division)

A student may be awarded Second Class (Upper Division) provided he/she,

i. obtains a minimum Grade Point Average of **3.30** and
ii. obtains grades of C or better in the specified courses aggregating to at least **85 credits** and grades of at least D in the remaining courses within 3 academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided him/her,

i. obtains a minimum Grade Point Average of **3.00**and
ii. obtains grades of C or better in the specified courses aggregating to at least **80 Credits** and grades of at least D in the remaining Courses within 4 academic years.

3.9.7 B.Sc. (FOUR-YEAR) DEGREE IN INFORMATION & COMMUNICATION TECHNOLOGY

3.9.7.1 Selection of Students

This degree would offer an extra year to third year degree to change to a four-year degree programme. The minimum requirements for applying for the degree programme are as follows:

(*a*) A student should have obtained a Grade Point Average of 3.00 for 65 credits accumulated during the first five semesters, including all the compulsory courses stipulated by the intended study programme.

(*b*) The best 65 credits accumulated during the first five semesters should not include more than 8 credits with D grades and any credit with an E grade**.**

At the end of their fifth semester, students may apply to follow the Four Year Degree Programme in Information & Communication Technology. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.7.2 Course Structure

During the fourth year, a student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

3.9.7.3 Option of Reverting to the General Degree

A student reading for a B.Sc. (Four-year) Degree in Information & Communication Technology may request the award of the B.Sc. (General) Degree foregoing the four-year degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.7.4 B.Sc. (Four-year) Degree in Information & Communication Technology – Awarding Criteria

To be eligible for the B.Sc. (four-year) Degree in Information & Communication Technology, a student should offer a minimum of 120 credits, with at least 26 credits per academic year. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120** credits will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. All courses specified as compulsory in the field of study are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the compulsory courses in the field of study aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain grade of **C or better** for the ICT 4609 course unit
iv. obtain at least **C grades** for the Foundation Courses given in Table 3.7.3.1 and
v. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete the requirements given in section 3.9.7.4to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided he/ she

i. obtains a minimum GPA **3.00** and
ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years

3.9.8 B.Sc. (GENERAL) DEGREE IN HEALTH PROMOTION

To be eligible for the B.Sc. (General) Degree in Health Promotion, a student should offer a minimum of **90 credits**, with at least **26 credits** per each academic year. In a case where a student has accumulated more than **90 credits,** the courses corresponding to the best **90** credits will be considered. In cases where the total number of credits does not add exactly to **90,** the best **91-93** credits may be considered.

N.B. All courses specified as compulsory in the field of study are included in the best 90 credits and hence will be counted for the calculations of the final GPA.

Furthermore a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **69 credits,** with **at least 22 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.2.1 and
iv. complete the relevant requirements within a period of five academic years.

Award of Class

N.B. A student has to complete all the requirements given in section 3.9.8 to be considered for the award of Class.

First Class

A student may be awarded First Class provided he/she,

i. obtains a minimum Grade Point Average of **3.70** and
ii. obtains grades of C or better in the specified courses aggregating to at least **90 credits** within three academic years

Second Class (Upper Division):

A student may be awarded Second Class (Upper Division) provided him/her,

i. obtains a minimum Grade Point Average of **3.30** and
ii. obtains grades of C or better in the specified courses aggregating to at least **85 credits** and grades of at least D in the remaining courses within 3 academic years.

Second Class (Lower division):

A student may be awarded Second Class (Lower Division) provided him/her,

i. obtains a minimum Grade Point Average of **3.00** and
ii. obtains grades of C or better in the specified courses aggregating to at least **80 Credits** and grades of at least D in the remaining Courses within 4 academic years.

3.9.9 B.Sc. (SPECIAL) DEGREE IN HEALTH PROMOTION

3.9.9.1 Selection of Students

At the end of their fourth semester, students may apply to follow a Special Degree Programme offered by the Department. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

The number of places available in each year will be decided by the subcommittee and will depend on the availability of resources. The students who are selected to follow the Special Degree Programme will study for a total period of four academic years.

The minimum requirements for applying for the Special Degree Programme are as follows:

(*a*) A student should have obtained a Grade Point Average of 3.00, for Health Promotion courses in the first four semesters and

(*b*) credits accumulated during first four semesters should not include more than 6 credits with D grades and any credit with E grade.

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.9.2 Course Structure

During the fourth year, a student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

3.9.9.3 Option of reverting to the General Degree

A student reading for B.Sc. (Special) Degree in Health Promotion may request the award of the B.Sc. (General) Degree foregoing the special degree, upon satisfying the requirements for the award of the B.Sc. (General) Degree.

3.9.9.4 B.Sc.(Special) Degree in Health Promotion– Awarding Criteria

To be eligible for the B.Sc. (Special) Degree in Health Promotion, a student should offer a minimum of 120 credits, with at least 26 credits per academic year. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120** credits will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. All courses specified as compulsory in the field of study are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.2.1 and
iv. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete the requirements given in section 3.9.9.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided him/ her

i. obtains a minimum GPA **3.00**and
ii. obtains grades of C or better in courses aggregating total least **108 credits** and grades of at least D in the remaining courses, within five academic years.

3.9.10 B.Sc. (HONOURS) DEGREE IN CHEMISTRY

3.9.10.1 Selection of Students

At the end of their third semester, students may apply to follow a Special Degree Programme offered by Departments. A limited number of students will be selected to pursue the programme, by a sub committee appointed by the Faculty Board, comprising of at least three academic staff members, including the Head of the relevant department.

The number of places available in each year will be decided by the subcommittee and will depend on the availability of resources such as laboratory facilities, supervisors etc. The students who are selected to follow the Special Degree Programme will study for a total period of four academic years.

The minimum requirements for applying for the Special Degree Programme are as follows:

(a) A student should have obtained a Grade Point Average of 3.00, for all the compulsory chemistry courses.

(*b*) The best 45 credits including all the compulsory courses accumulated during the first three semesters should not include more than 6 credits with D grades and any credit with an E grade**.**

N.B. Extra-curricular activities of the student will be considered as additional qualifications, provided he/she has obtained the minimum requirements for applying, given above.

3.9.10.2 Course structure of the Special Degree Programme

During the fourth year, a special degree student should carry out a specified project on a given topic under the supervision of a senior member of the academic staff. The project will be assigned to the student at the beginning of the 4th academic year and should be completed within the course of that year.

The credits accumulated over the entire four-year period shall be considered for the award of the degree.

Guidelines for the selection of courses in the B. Sc. (Special) Degree in Chemistry are given in section 4.2.

3.9.10.3 Option of reverting to the General Degree

A student reading for a B.Sc. special degree may request the award of the B.Sc. General Degree foregoing the special degree, upon satisfying the requirements for the award of the B.Sc. General Degree.

3.9.10.4 B.Sc. (Special) Degree – Awarding Criteria

To be eligible for the B.Sc. (Special) Degree, a student should offer a minimum of 120 credits, with at least 26 credits per academic year and with not less than 72 credits in the area of specialization. In case where a student has accumulated more than **120 credits,** the courses corresponding to the best **120** credits will be considered. In cases where the total number of credits does not add exactly to **120,** the best **121-123** credits may be considered.

N.B. All courses specified as compulsory by a student's area of specialization are included in the best 120 credits and hence will be counted for the calculations of the final GPA.

Furthermore, a student should

i. have a minimum Grade Point Average (GPA) of **2.00,**
ii. obtain grades of C or better in the specified courses aggregating to a minimum of **92 credits** equivalent to **23 credits per each academic year**, and at least grades of D in the remaining courses,
iii. obtain at least **C grades** for the Foundation Courses given in Table 3.7.1.1. and
iv. complete the relevant requirements within a period of six academic years.

Award of Class

N.B. A student has to complete all the requirements given in section 3.9.2.4 to be considered for the award of Class.

First Class

A student shall be awarded First Class if he/ she

i. obtains a minimum GPA of **3.70** and
ii. obtains grades of C or better in courses aggregating to at least **120 credits** within four academic years.

Second Class (Upper Division)

A student shall be awarded Second Class (Upper Division) if he/ she

i. obtains a minimum GPA **3.30** and
ii. obtains grades of C or better in courses aggregating to at least **112 credits** and grades of at least D in the remaining courses, within four academic years.

Second Class (Lower Division)

A student may be awarded Second Class (Lower Division) provided him/her

i. obtains a minimum GPA **3.00** and
ii. obtains grades of C or better in courses aggregating to at least **108 credits** and grades of at least D in the remaining courses, within five academic years.

4. SYLLABI

4.1. SYLLABI OF THE COURSES

4.1.1 FIRST YEAR PROGRAMME OF STUDY

4.1.1.1 FOUNDATION COURSES AND INTERDISCIPLINARY COURSES

FDN 1201 - GENERAL ENGLISH

Before the commencement of the academic year for the 1st year students, an intensive course in English, duration of which is 12-16 weeks is conducted by the Faculty. It is compulsory for all the 1st year students to attend these classes regularly. The students are grouped according to their standard of English, which is determined by means of an examination held at the beginning of the course. The students are also tested at the end of the intensive course. All the students are advised to make the maximum use of this course to improve their knowledge of English, as English would be the medium of instruction of all the Degree Programmes. Although this course is delivered in general as mentioned above, the Faculty may decide to conduct the course during the first semester of study.

FDN 1202 – INTRODUCTION TO COMPUTERS

Introduction to computers: General computer architecture, Components of the computer, Hardware & software, Programming languages. **Operating Systems**: DOS and windows. Micro-Computer Applications: A Word Processor – MS Word: Table, Drawing, Inserting objects, A spread sheet – MS Excel, An RD BMS – MS Access, A Web designing tool-MS frontpage.

FDN 1203 - GENERAL BIOLOGY

The Nature of Biology: The branches of Biology, Methods of inquiry in Biology, some basic concepts, Applied Biology. Biomes to Microhabitats. Communities and Ecosystems. Pollution and Conservation. Systematics: The taxonomic hierarchy, Naming of organisms. **Classification of Organisms:** Prokaryota, Monera, Protista, Fungi, Plantae, Animalia. The Cell as a basic unit: Fine structure of Prokaryotic and Eukaryotic cells. Tissues, Organs 0and Individuals: Animal tissues, Plant tissues, Organs and organ systems. **Nutrition:** Autotrophic and heterotrophic nutrition, Photosynthesis.

Respiration: Aerobic and anaerobic respiration, BMR. Transport in animals and plants. Defense against diseases: Defense systems in animals, Plant defenses against diseases. **Reproduction:** Asexual and sexual reproduction. **Principles of Heredity:** Monohybrid inheritance, Dihybrid inheritance. Evolutionary trends.

FDN 1204- BASIC MATHEMATICS

Sets and inequalities, Linear equations, Quadratic equations, Functions and Graphs, Trignometric functions, Limits, Derivatives (Differentiation), Curve sketching, Maximum-Minimum problems, Exponential and logarithmic functions, Techniques of Integration, Areas and volumes, Tangent and Normal, Partial derivatives, Matrices and determinants. Introduction to vectors, Linear combinations, Linear dependence and independence, Bases and dimensions, Scalar product, Vector Product, Triple scalar product, Triple vector product. Solutions of vector equations involving products, Cylindrical polar coordinates, Spherical polar coordinates. Introduction to statistics.

IDC 1201 - PHILOSOPHY OF SCIENCE

The aims and objectives of philosophy, Historical development of philosophical thought, Problems related to Theory of Knowledge, Analysis of Metaphysical problems, Analysis of ethical issues, Analysis of the problem of Inductive Knowledge, Philosophical analysis of the reliability of scientific knowledge. Can fundamental philosophical questions be answered by the science, the limitations of empirical knowledge.

IDC 1202 - CAREER DEVELOPMENT

This course has been designed to provide the students with the key elements of career development and progression, enabling them to choose their career path during the study programme. The students should get registered for this course in the second semester of the first year and they will be assessed through continues assessments and a portfolio assessment at the end of the third year. Please note that this is a compulsory and a non-GPA course.

4.1.1.2 CHEMISTRY

CHE 1201 - GENERAL CHEMISTRY

Atomic Structure: Planetary Model and Bohr's Model for the Atom, Atomic Spectrum of Hydrogen, Quantum Mechanical for the Atom, Basic Principles of Quantum Mechanics, Electron Clouds, Wave function, Four Quantum Numbers, Multi-electron Atoms, Electronic Configuration, Periodic Law and Periodic Properties. **Chemical Bond:** Introduction and Types of Bonding, Lewis, Sidgwick-Powell and VSEPR Theories, Overlap of Atomic Orbitals and Hybridization, Valence Bond Theory, Molecular Orbital Theory, Structure of Ionic Crystals, Energies of Ionic Compounds, Covalent Character of Ionic Bonds. **Chemistry of Elements:** Alkali Metals, Alkaline Earth Metals, Group 13 Elements, Halogens, d-Block Elements.

CHE 1302 - PHYSICAL CHEMISTRY I

Chemical Thermodynamics: Basic Concepts and Terminology, First Law of Thermodynamics, Applications of the First Law of Thermodynamics, Thermochemistry, Second Law of Thermodynamics, Applications of the Second Law of Thermodynamics, Free Energy Functions, Thermodynamic Potentials, Thermodynamic Equations of State. **Gases:** Introduction to Gas Laws, Kinetic Molecular Theory of Gases, Applications of the Kinetic Molecular Theory of Gases, General Behaviour of Gases, Van der Waals Equation of State, Other Equations of State, Liquefaction of Gases, Critical Region and Critical Constants.

CHE 2201 - PHYSICAL CHEMISTRY II

Phase Equilibria: Terminology, Phase Rule, Thermodynamics of Phase Changes in Univariant Systems, One Component Systems, Two Component Systems, Raoult's Law, Phase Diagrams and Distillation of Binary Systems, Phase Diagrams of Non-Ideal Mixtures, Solid-Liquid Equilibria, Solid Solutions. **Quantum Mechanics:** Birth of Quantum Mechanics, Basic Principles of Quantum Mechanics, Mathematical Aspects of Quantum Mechanics, Applications of Quantum Theory to Simple Systems. Chemical Kinetics.

CHE 1203 - ORGANIC CHEMISTRY

Nomenclature of organic compounds, Alkyl halides, Substitution and elimination reactions, Free radical reactions, Alkenes and alkynes, Electrocyclic reactions and cycloadditions, Aldehydes and ketones, Nucleophilic-additions, Carboxylic acids andtheir derivatives, Enolates and carboanion building blocks for organic synthesis, Amines, Aromatic electrophilic substitution, Aromatic nucleophilic Substitution, Benzyne mechanism, Carbanions, Carbenes.

CHE 1104 - INORGANIC CHEMISTRY - LABORATORY

Introduction to apparatus and equipment, Handling techniques. Entering and calculations, Qualitative and quantitative Inorganic chemistry, Titrimetric methods, Microanalysis of Inorganic compounds, Halides, Carbonates, Sulphates and Metal ions.

CHE 1105 - ORGANIC CHEMISTRY - LABORATORY

Organic analysis: Identification of acidic, basic, phenolic, and neutral organic substances; Detection of nitrogen, sulfur and halogens; Test for aliphatic and aromatic nature of substances; Test for saturation and unsaturation; **Identification of functional groups**: carboxylic acids, phenols, aldehydes, ketones, esters, carbohydrates, amines, amides and halogen compounds.

4.1.1.3 PHYSICS

PHY 1201 - GENERAL PHYSICS

Forces of Nature: The principle of inertia, Inertial frames, Newton's principles of relativity, Accelerating frames and inertial forces; Gravitational mass, Accelerating frames an gravity, Gravitation, Kepler's laws of planetary motion, Newton's laws of gravitation, Determination of the value of g, Weightlessness, Collisions and conservation laws, Conservation of liner momentum, Action, reaction and impulse, Motion of a rocket. Rotational Dynamics: Angular momentum and its conservation, Moment of inertia, Gyroscopic motion and precession. **Fluids, their flow and properties:** Stream line flow, Equation of continuity, Bernoulli's theorem, Air lift and drag, Viscous forces and viscosity, Poiseuille's formula and corrections, Methods of determination of viscosity, Surface energy and surface tension, Methods of determination of surface tension. **Kinetic Theory:** Basis and assumptions. Derivations of an expression for gas laws, First law of thermo dynamics, Equipartition of energy, Specific heats at constant volume and pressure, Mean free path, Adiabatic and isothermal processes, Molecular phenomena, Distribution of molecular velocity.

PHY 1102 - WAVES AND VIBRATIONS

Simple Harmonic Vibrations: Composition of simple harmonic vibration (a) at right angles; Lissajous figures, (b) in the same straight line, Same period, Using amplitude phase diagram (c) in the same straight line, Different periods. Huygens' Principle and **Applications:** Laws of reflection and refraction for plane wave at plane surface, Doppler Effect. **Wave Motion:** Simple harmonic and a harmonic oscillators, Damped harmonic oscillators, Fourier analysis, Wave equation, longitudinal waves, Transverse waves, Energy consideration of waves, Reflection and refraction of waves, Helmholtz resonator, Group velocity and phase velocity**. Musical Sounds and Instruments:** Vibrations in strings, Air columns, Plates and rods, Kundt's tube.

PHY 1203 - FUNDAMENTALS OF ELECTROMAGNETISM

Electrostatistic: Review of basic concepts of electrostatics, Coulomb's law, Electric flux and Gauss' law, Potential difference, equipotential surfaces, Charge distribution on conductors, Electric images, and Point discharge. **Current Electricity:** Ohms law and its derivation using free electron theory, Temperature dependence of the resistance, Cary-Foster bridge, Rayleigh potentiometer, Kirchoff's laws, Maxwell's cyclic currents, Unbalanced Wheatstone bridge. **Electromagnetism:** Biot–Savart law, Helmholtz coils, Solenoid magnetic shell, Ampere's circuital theorem, Force on a current carrying conductor, Laws of electromagnetic induction, Eddy currents, Search coil, Self inductance and mutual inductance.

PHY 1104 - MODERN PHYSICS

Charged particles: Conduction of electricity in gases, Production and properties of X-rays, Thompson's and Bainbridge's mass spectrograph, Charged particle accelerators. **Spectra:** Rutherford's model of the atom, Bohr's model of the hydrogen atom, Explanation of line spectra, Series spectra, X-rays, X-ray spectra, Mosley's law. **Special theory of relativity:** Introduction to inertial frames, Galilean transformation equations, Invariance of physical laws, Propagation of light, Einstein's postulates, Time dilation, Length contraction, Doppler effect, Space time diagram, Lorentz transformation equations, Energy-momentum relation.

PHY 1205 - PRACTICAL UNIT

Introduction to apparatus and equipment. Handling techniques, Selection of measuring instruments and methods, Entering and calculations, some selected practical related to first year lectures.

4.1.1.4 BIOLOGY

BIO 1201 - CELL BIOLOGY AND BIOCHEMISTRY

Biomolecules and Molecular Organization: Inorganic ions, Carbohydrates, Lipids, Proteins, Nucleic acids, Identification of Biomolecules, DNA Replication, Transcription and translation of genetic information; **Cytology:** Cell ultra- structure, Cell Division; Biological membranes: Structure and functions; **Enzymes:** General properties and mechanism of action; Enzyme kinetics, Bioenergitics.

BIO 1202 - STATISTICAL METHODS IN BIOLOGY

Introduction to the scope and nature of statistics, Data collection and visual representation of data, Measures of position and dispersion, Normal distribution and its applications, Confidence intervals, Concept of hypothesis testing, Chi square test of independence and goodness of fit, Scatter plots and correlation, Least squares regression, Use of statistical software.

BIO 1203 - GENERAL MICROBIOLOGY

The microbial world and you, microbial naming and classification, microscopy, bacterial cell structure and functions, bacterial identification, nutrition and metabolism of microorganisms, microbial growth, microbial interactions, ecological and economic importance of microorganisms; plant growth promoting rhizobacteria, blue green bacteria and actinomycetes, mycoplasma, introduction to viruses, viroids and prions, general structural characteristics of viruses, disease mechanisms, host/pathogen relationships, virus and cancer, antibiotic producing microorganisms, control of microbial growth, microbial biofilm formation.

4.1.1.5 BOTANY

BOT 1201 - PLANT DIVERSITY

Historical development of biological classification, Key events of plant evolution, Characteristics of major taxonomic groups in kingdoms Fungi, Protista (only algae) and Plantae (excluding Anthophytes), Economic and ecological importance of fungi, algae, bryophytes, pteridophytes and gymnosperms, Habitat preference and evolutionary affinities in and among fungi, algae, bryophytes, pteridophytes and gymnosperms, Introduction to lichens- an alliance between kingdoms

BOT 1202 - FUNCTIONAL PLANT ANATOMY AND BASIC WOOD SCIENCE

Introduction: Organization of plant body; Types of meristematic tissues and their origin and functions; Primary structure and secondary growth of typical stem and root in relation to functions. Anatomy of typical dicot, monocot leaves and circular leaf in relation to functions; Anomalous secondary growth in plant stems and roots; Ecological Plant Anatomy: variation in structure, related to habitat; Wood: Physical and chemical structure of wood, relationship between wood anatomy and physical properties and technical performance of timber, identification of timber with special reference to local species, defects of wood, grading of timber, wood seasoning, wood preservation and wood based industries in Sri Lanka.

4.1.1.6 ZOOLOGY

ZOO 1201 - INVERTEBRATE DIVERSITY

Animal body plans, Diversity of major invertebrate phyla: Protozoan groups and Phyla Porifera, Cnidaria, Ctenophora, Platyhelminthes, Nematoda, Mollusca, Annelida, Onychophora, Arthropods, minor invertebrate phyla, Echinodermata.

ZOO 1302 - VERTEBRATE DIVERSITY

Chordate Body plan, Major features of Phylum Chordata, Diversity of major Vertebrate classes: Jawless fish, Jawed fish, Amphibia, Reptilia, Aves, Mammalia

ZOO 1103 - LABORATORY TECHNIQUE IN ZOOLOGY

Safety in a biological laboratory, Preparation of widely used chemical reagents, Microscopy, Microtome, Preparation of temporary & permanent slides of Parasitological and Histological specimens using single and double staining methods, Taxidermy, Preparation of permanent mounts of insects, Preparation & mounting of skeletons, Embedding biological specimens in liquid plastic, Field techniques for zoological specimen collection and preservation.

4.1.1.7 COMPUTER SCIENCE

COM 1201 - PRINCIPLES OF PROGRAMME DESIGN

Techniques of Problem Solving: Problem solving, Methodologies, Algorithms, Flowcharts, Pseudo Codes, Paper Simulations, Programming Paradigms.

COM 1302 - DATABASE MANAGEMENT SYSTEMS

Basic Concepts: File Systems, File handling (Sequential access, Direct access, and Random access), What it is a Database System? What is a Database? Why Database? Data independence, Three levels of architecture (External, Conceptual, and Internal), Database access, Page sets and files, Indexing, Hashing, Compression techniques. Relational Data Structure: Domains, Relations, Relational Databases. **Relational integrity rules:** Primary keys, Entity integrity rule, Foreign keys, Referential integrity rule. **Relational algebra:** Syntax of Relational Algebra, Traditional set operations, Special relational operations, Additional operators, Relational assignment. **Database design:** Functional dependence, First, Second, and Third normal forms, Good and bad decompositions, Boyce/Codd normal form, 4th and 5th normal forms, Entity/Relationship model, E/R diagrams, Database design with E/R model. **Relational systems:** SQL, Data definition, Data manipulation.

COM 1305 - OBJECT ORIENTED PROGRAMMING

Introduction: What is an object? What is a class? Difference between classes and objects, Object-oriented view of a system, Structured Programming Vs. Object-oriented programming. **UML:** Use case diagrams, Class diagrams, Sequence diagrams, Activity diagrams and State chart diagrams. **Classes and Objects:** Determining Object Behavior, Defining Methods, Instance Variables, Static Variables, Variable Lifetime and Scope, Constructors, Instantiation, Destructors, Static Variables, Static Methods, Super class, Sub class. Public, Private and Protected classes. Methods: Method Implementation, Static Methods, Method Overriding, Accessor and Mutator Methods, Operator Overloading. **Inheritance:** Single Inheritance, Multiple Inheritance, Inheritance Hierarchies, Static and

Dynamic binding, Polymorphism, Converting between class Types, Preventing Inheritance.

COM 1407 - COMPUTER PROGRAMMING

Fundamentals of C Programming: Structure of a C Programme, Input/Output, Variable Declaration, Arithmetic Operations, Relational Operations, Logical Operations. **Control Structures:** If/Else, While repetition, For repetition, Switch multiple selection, Do/While, Break and Continue, Functions, Scope of Variables and Parameters, Recursion, Arrays, Records, File processing, Comparison of structure and class, Pointers, Dynamic memory allocation, Pointers to functions.

COM 1308 - DIGITAL LOGIC DESIGN

Digital concepts: basic logic operations, logic functions, introduction to ICs. **Logic Gates and Circuits:** AND, OR, NOT, NOR, NAND, XOR. **Boolean Algebra and Logic Simplification**: Boolean Operations, De Morgan's theorem, Karnaugh Map. **Combinational logic:** design in combinational logic, adders, comparators, decoders, encoders, multiplexers, DE multiplexers. **Sequential logic:** design in sequential logic flip-flops, timers, counters, shift registers, memories.

4.1.1.8 MATHEMATICS

MAP 1301 – LINEAR ALGEBRA

Introduction. Preliminaries: The space Rn, Linear independence Subspaces and bases, Matrices, Operations with matrices, Linear transformations and matrices, Linear equations and inverse of a matrix. Determinants: Expansion by cofactors, Properties of determinants, Pivotal condensation, Cramer's rule. **Simultaneous Linear Equations:** Linear systems, Solutions by inversion, Gaussian elimination, Linear independence, Rank of a matrix, Theory of solutions, Homogeneous systems. **Eigenvalues and Eigenvectors:** Definitions, Eigenvalues, Eigenvectors, Properties of eigenvalues and eigenvectors. Matrix Calculus: Definitions, Cayley-Hamilton theorem, Polynomials of matrices, Function of a matrix. **Spacial Matrices:** Inner products, self -adjoint matrices, Real symmetric matrices, Orthgonal matrices, Hermitian matrices, Unitary matrices, Positive definite matrices. Idempotent matrices.

MAP 1302 – DIFFERENTIAL EQUATIONS I

First Order Ordinary Differential Equations: Linear equations, Variable Separable equations, Exact equations, Bernoulli's equation, Clairaut's equation, Integrating factors, Geometrical interpretation and Applications. Second Order Ordinary Differential **Equations:** Linear equations with constant coefficients, Wronskian, Differential operator, Homogeneous equations, Characteristic equations, Particular and General Solution, Simultaneous equations.

MAP 1203 – REAL ANALYSIS I

Functions: Functions of real variables, Types of functions, Maxima, Minima, Neigbourhoods (nbhd), Limits, Theorems on limit. **Continuity:** Right hand continuity, Left hand continuity, Uniform continuity, Sectional continuity, Differentiability and derivatives. Rolle's theorem. Mean value theorem. Taylor's theorem. L'Hospital rule. **Sequences:** Limits of a sequence, Bounded and monotonic sequences, Limit superior and limit inferior, Cauchy sequences.

MAA 1201 – MATHEMATICAL METHODS I

Introduction to vectors. Linear combinations. Linear dependence and independence. Vector Geometry: Collinear vectors, Coplanar vectors, Vector equations of a line, Tetrahedron, Parallelpiped pyramid and prism. Vector Functions of Single Variable: Differentiation and integration, Space curves, Tangent and normal. Functions of Several Variables: Scalar and vector fields, Direction of derivatives, Gradient vector, Divergence, Curl, Vector identities, Scalar potential of a conservative field, Laplace's equation.

MAA 1302 – PROBABILITY AND STATISTICS I

Representation of Data: Histograms, Frequency polygon, Ogive, Stem & leaf diagrams. **Measures of Location:** Mean, Median, Mode, Quartiles, Deciles, Percentiles. **Measures of Dispersion:** Range, Interquartile range, Variance, Standard deviation, Coefficient of variation, Moments, Skewness, Kurtosis, Box plots, Covariance and correlation coefficient. Elements of Probability: Experiments, Sample space, Laws of probability, Conditional probability, Baye's theorem, Independent events. Random Variables: Discrete, Continuous. Probability mass function, Probability density function, Cumulative distribution function, Expectation and variance,

Moment generating function. **Probability Inequalities:** Chebyshev's inequality, Markov's in-equality. Discrete Distributions: Uniform, Bernoulli and binomial, Poisson, Geometric, Hyper geometric, Multinomial. Continuous Distributions: Uniform, Normal, Gamma, Exponential. Approximation to binomial using poisson distribution and normal distribution, Approximation to poisson using normal distribution.

MAA 1203 – NUMERICAL ANALYSIS I

Number systems and Errors, Finite differences, Factorial polynomials. Numerical Methods of Solving Non-linear Equations: Newton-Raphson method, Method of falsi position, Direct iteration, Collocation polynomials, Taylor polynomial, Osculating polynomial, Linear difference equations of 1st order and 2nd order. Numerical Methods of Solving Differential Equations: Taylor method, Runge-Kutta method.

MAA 1104 – MATHEMATICAL MODELLING

Introduction. Need. Techniques, Classifications and simple illustrations, Mathematical modelling through ordinary differential equations of first order, Mathematical modelling through ordinary differential equations of second order, Mathematical modelling through difference equations.

4.1.1.9 HEALTH PROMOTION

HPT 1201 - BASIC PHYSIOLOGY

Physiology of gastrointestinal, cardiovascular, nervous, muscular, excretory and reproductive systems. Homeostasis. Endocrine glands, hormones and functions.

HPT 1202 - INTRODUCTION TO HUMAN DISEASES AND HEALTH

Disease causing agents. Types of diseases. Effects of climatic changes and settlement patterns on health. Body's defense mechanisms.

HPT 1103 - CONCEPTS OF HEALTH

Definitions of health. Changing concepts of health (Holistic, biomedical, social). Health continuum. Components of health and its interactions. Practical application to promote wellbeing of individual and communities.

HPT 1104 - HISTORY AND EVOLUTION OF HEALTH PROMOTION

Health promotion practice. Evolution of health promotion. Different aspects or approaches to health promotion, 'Health educational' approach, 'Healthy life styles' approach. 'Structural determinants of health' approach.

HPT 1105 - INTRODUCTION TO MASS COMMUNICATION

Aims and functions of communication. Classification of communication. Mass communication, Interpersonal and group communication. Public opinion and mass media. Theories in communication. Origin of news and news reporting.

HPT 1206 - NUTRITION AND METABOLISM

Principal components of diet. Digestion, absorption, transport and metabolism of carbohydrates, lipids and proteins. Micronutrients. Vitamins, Nutrition in relation to age and diseases. Nutritional needs during pregnancy and lactation. Deficiency problems and remedial measures.

HPT 1107 - REPRODUCTIVE PHYSIOLOGY & DEVELOPMENTAL BIOLOGY

Origin of germ cells. Reproductive cycles. Oestrous cycle. Hormonal control of the menstrual cycle. Regulation in pregnancy, parturition and lactation. Artificial insemination. Embryo transfer. Methods of control of fertility. Embryonic induction. Foetal development in human. Anomalous babies.

HPT 1208 - PRINCIPLES, STRATEGIES AND PRACTICES IN HEALTH PROMOTION

Operationalizing of the concept of wellbeing. Principles of health promotion. Assessment of changes of one's health status. Influences of one's group and other structural determinants. Simple measures to improve health. Group processes in determining goals for health improvement. Initiating change: facilitators and inhibitors.

HPT 1209 - MEASURES OF HEALTH

Aspects of wellbeing. Importance of measuring health. Characteristics of measurements. Challenges of measuring health status of individuals and communities. Measurement as a tool to promote wellbeing. Practical application of measurement of wellbeing. Traditional indicators.

HPT 1210 - RESEARCH METHODS

Introduction to research process, methodologies, writing research proposals and presentation of findings. Research report evaluations. Survey designs. Sampling. Use of quantitative and qualitative approaches in research. Data collection methods. Designing tools. Data processing, analysing and reporting.

FIELDWORK

HPF 1101 - DEVISING APPLICABLE MEASURES OF INDIVIDUAL AND GROUP HEALTH

Identification of measures those are applicable to assess individual and group health. Creating measures to assess individual and group health. Recognizing qualitative and quantitative measures. Developing objectives to improve individual and group health.

HPF 1102 - MEASURING HEALTH STATUS A GROUP

Use of devised measures to assess individual and group health. Recognizing objective and subjective changes. Recognizing sensitive indicators of progress. Helping others to recognize small gains. Record keeping and retrieval.

HPF 1203 - ACTIVITIES TO IMPROVE HEALTH OF STUDENT GROUPS

Identifying factors that affect individual and group health. Designing activities to address identified factors. Implementing activities. Assessing effectiveness of implemented activities. Identification of impediments in applying activities. Reflecting on and assessing the value system and its implications.

4.1.1.10 INFORMATION AND COMMUNICATION TECHNOLOGY

ICT 1201 – FUNDAMENTALS OF COMPUTER SYSTEMS

Introduction: Early history of computing, Computer generations, Characterization, Classification of computers, Basic components and organization of a computer, Representation of information in a computer, Concept of programming and programming languages, Language translation. Application Software: Basic features of application software. Tools for work and study: Desktop Accessories, Word Processing, Spreadsheets, Database Management Systems, Graphics, Communications, Software Suites, etc. Operating Systems and its functions: The need for an operating system, the types of operating systems, the features of the MS-DOS/Windows XP operating system, Linux. Utility programmes, Utility packages. Peripherals: Input devices and its functions, Output devices and its functions, Processing and memory hardware, Secondary storage and communication devices, Introduction to device ports, assembling a computer. Computers and communication: Revolution in computers and communication. The digital future: Role of IT in society, Distinguish between data and information, Properties of information and basic IT tools, e-learning, e-banking. Social issues: Ethics and standards in computing, Copyright, Intellectual property right, Piracy.

ICT1402 – PRINCIPLES OF PROGRAMME DESIGN AND PROGRAMMING

Concept of programming and programming languages, Language translation. Techniques of Problem Solving: Problem analysis, Algorithms, Flowcharts, Pseudo Codes, Paper Simulations. Fundamentals of C Programming: Structure of a C Programme, Input/Output, Types of Variables, Arithmetic Operations, Relational Operations, Logical Operations. Control Structures: If/Else, While repetition, For repetition, Switch multiple selection, Do/While, Break and Continue, Functions, Scope of Variables, Parameters, Recursion, Arrays, Records, Comparison of structure and class, Pointers, Dynamic memory allocation, Pointers to functions, File Handling.

ICT 1303 – BASIC ELECTRONICS AND DIGITAL LOGIC DESIGN

Introduction to electronics and electronic systems, introduction to semiconductor and devices like diodes, BJT, FET, MOSFET, Rectifier and Filters, introduction to transistor biasing. Small signal transistor amplifiers, Digital concepts: basic logic operations, logic functions, introduction to ICs. Combinational logic: adders, comparators, decoders, encoders, multiplexers, de-multiplexers. Sequential logic: flip-flops, timers, counters, shift registers, memories, ALU.

ICT 1404 - MATHEMATICS AND STATISTICS FOR COMPUTING

Matrices and Determinants: Introduction to determinants, Properties of determinants, Evaluation of 2nd order and 3rd order determinants, Cramer's rule and its use of solving linear equations, Introduction and types of matrices, Scalar product, Addition, Subtraction, Multiplication, Inverse of a matrix and applications (solving linear equations). Mathematics and Logic: Set theory, Combinatorics, Propositional logic, Relations and Functions, Theory of series, Tailor's Theorem. Basic Statistics: Probability concepts, Analysis and presentation data, Probability Distribution: Normal, Binomial, Poisson, Exponential, Regression, Correlation, Random Numbers.

ICT 1305 - DATA STRUCTURES

Data structures: Random Access and Sequential access, Performance Analysis, Big O notation, Arrays, Array based Lists, Linked Lists: Array Based, Singly Linked, Doubly Linked, Circular, Sorted. Stacks using Arrays and Linked Lists, Queues using Arrays and Linked Lists, Hash Tables using Arrays and Linked Lists, Trees using Arrays and Linked Lists, Graphs: Depth First Search, Breadth First Search. Simple Sorting & Searching Algorithms: Selection sort, Bubble sort, Merge sort, Binary search.

ICT 1306 - OBJECT ORIENTED PROGRAMMING

Object Oriented Concepts: Objects, Classes, Instances, Methods and Attributes, Inheritance, Encapsulation, Polymorphism, Abstraction, Dynamic Binding, Defining Member Functions, Constructors and Destructors, Copy Constructors, Access modifiers, Static Data Members, Static Member Functions, Type conversions, Extending Classes, Defining Derived Classes, Single Inheritance, Multilevel Inheritance, Multiple Inheritance. Object Oriented Programme Designing: Language APIs, Instance Creation, Event Handling, Input/Output, Threads, Concurrent Processes.

ICT 1407 - DATABASE SYSTEMS

Introduction: Definition as a centralized storage of database, File based Systems, Prevention of redundancy and inconsistency, Data independence, Data abstraction, Data models, Database System Architecture, Entity-Relationship Model and Extended Entity-Relationship Model: Entities, Relationships, Entity sets, Relationship sets, Attributes, Mapping constraints, Keys, E-R diagrams, Map E-R diagrams to relations, Design of an E-R database scheme. Relational Model: Structure of relational database, Relational algebra. Normalization and Relational Database Design: Relational database design and its pitfalls, Normalization (First, Second, Third and BCNF), using functional dependencies and multivalued functional dependencies. Overall system structure: Indexing and hashing, SQL (DML, DDL), Awareness of advanced topics. Integration and Application Design: Introduction to database integration techniques.

ICT 1308 - OPERATING SYSTEMS

Introduction: Advanced Hardware Features, Operating Systems Design and Architecture

Concurrent Processing: Process Scheduling and Deadlocks, Inter process Communication and Synchronisation, Interrupt Handling, Memory allocation and deallocation, File Systems and Disk Management. Introduction to Distributed Computing: Virtualisation, Process Distribution, Distributed File Systems

4.1.2 SECOND YEAR PROGRAMME OF STUDY

4.1.2.1 INTERDISCIPLINARY COURSES

IDC 2201 - English for Professional Purposes

This is a 2 credit course offered in the second year – first semester. The objective of the course is to prepare students to function in an English-speaking work environment before and after graduation. The course contents include interview skills, presentation skills, meeting skills, CVs and Cover Letters, Business correspondence including emails and official letters, Computer Assisted Language Learning (CALL), and language structure for professional communication.

IDC 2203 - Principles and Practices of Marketing

Marketing as an organizational function (introduction), Core marketing concepts, Marketing environment and environment analysis, Orientations of marketing, Consumer behavior, Segmenting, targeting and positioning, Marketing mix, Product and branding strategies, Pricing strategies, Marketing channels and strategies, Promotional strategies, Preparation of a marketing plan.

4.1.2.2 CHEMISTRY

CHE 2201- PHYSICAL CHEMISTRY II

Phase Equilibria: Terminology, Phase Rule, Thermodynamics of Phase Changes in Univariant Systems, One Component Systems, Two Component Systems, Raoult's Law, Phase Diagrams and Distillation of Binary Systems, Phase Diagrams of Non-Ideal Mixtures, Solid-Liquid Equilibria, Solid Solutions. Quantum Mechanics: Birth of Quantum Mechanics, Basic Principles of Quantum Mechanics, Mathematical Aspects of Quantum Mechanics, Applications of Quantum Theory to Simple Systems. Chemical Kinetics:

Basic concepts & terminology, Rate & order of a reaction, Factors Affecting the rate of a reaction, Complex reactions, Chain reactions, Catalysis. Surface Chemistry: Surface properties, Liquid-gas interface, Gibbs adsorption isotherm, Solid–gas interface, Langmuir adsorption isotherm, Colloid & macromolecular chemistry.

CHE 2202 - ORGANIC CHEMISTRY II

Stereoisomerism: Optical and geometrical isomerism, Absolute and relative configurations, Asymmetric synthesis. Aromaticity, Valence bond and Molecular Orbital approach, Arenes, Alkenyl benzenes, Polyphenyls, Aromatic substitution, Aromatic nitro compounds, Aromatic sulphonic acid, Phenols and Quinones, Aromatic ethers, Aromatic carboxylic acids, Dyes.

CHE 2103 - ANALYTICAL CHEMISTRY

Quantitative Analysis: Sampling procedures, sample population, significance of representative sampling, working curve, blank solution, standard-addition technique, curve fitting, graphical analysis, Quality Control/Quality Assurance. Measurements and errors in chemical analysis, Significant figures, Statistical treatment of data, Graphical analysis. Gravimetric calculations. Titration curves. Theory of pH. Indicators and Buffers. Complexometric titrations. Chromatography: Paper chromatography, Thin layer chromatography and gas chromatography

CHE 2104 - INTRODUCTION TO BIOCHEMISTRY

The macromolecules and chemical reactions of Life; amino acids and proteins, isoelectric points, primary secondary, tertiary, and quaternary structure of proteins; protein folding and denaturation, hemoglobin structure and function, oxygen binding capacity of Hb and Mb, Bohr effect; introduction to enzymes. Simple and complex carbohydrates; monosaccharides, disaccharides, polysaccharides (structural and storage polysaccharides, homo and hetero polysaccharides). Lipids and membranes, phospholipids, glycolipids, cholesterol, membrane mobility. Vitamins and cofactors, nucleotides and nucleic acids; structure of DNA and RNA; ATP as a source of biochemical energy.

CHE 2205 - INORGANIC CHEMISTRY

Coordination Chemistry: IUPAC nomenclature of transition metal complexes, Type of ligands, Coordination chemistry of metal complexes, Isomers, Hybridization and geometry. Bonding theories of transition metal complexes, crystal field theory, ligand field theory and molecular orbital theory. Jahn Teller theory and its applications. Variation in colour, Magnetic properties and reactivity of coordination complexes. Solid state: Classification of Solids: Crystalline solids, amorphous solids, distinction between crystalline and amorphous solids, molecular crystals (Van der Waals crystal), covalent crystals, ionic crystals. X-ray Diffraction: Diffraction methods in the study of solids, Bragg equation, the use of x -rays in structural studies, single crystal and powder diffraction methods in the determination of crystal systems, unit cell parameters, number of formula units in the unit cell, application of powder diffraction data. Nuclear and radio chemistry: Atomic nucleus, radio isotopes, binding energy, nuclear stability, radioactivity and decay, nuclear reactions, effects of radiation on matter.

CHE 2106 - SPECTROSCOPIC METHODS IN ORGANIC CHEMISTRY

Introduction to the use of spectroscopic/spectrometric methods in structure elucidation, electromagnetic radiation and absorption spectroscopy. Ultraviolet-Visible spectroscopy: Electronic excitations of molecules, effect of conjugation, chromophores, auxochromes and solvent effects, Woodward-Fieser rules and Beer Lambert law. Infrared spectroscopy: Modes of fundamental vibrations, IR active, force constant, vibration coupling, Fermi resonance and absorption characteristics of functional groups, finger print region and instrumentation. NMR Spectroscopy: Nuclear precession, NMR Spectrometer, 1H- NMR, Chemical shift and its measurement, Factors influencing chemical shift, Long range coupling, First order splitting, Chemical exchange and splitting, Coupling constants and molecular structure. Mass spectrometry: Molecular ion, important fragmentation pathways, rearrangements of molecular ions,

McLafferty rearrangement, isotopic peaks, metastable peaks, mass spectrometer and various ionization techniques in mass spectrometry - Electro spray ionization.

CHE 2107 - ORGANIC CHEMISTRY - LABORATORY

Organic synthesis. Separation techniques: Paper chromatography, thin layer chromatography, column chromatography and organic synthesis, Solvent Extraction, Analysis of IR, UV, NMR, Mass and AA spectra.

CHE 2108 - PHYSICAL CHEMISTRY - LABORATORY

Analytical calculations, sampling, types of errors, precision, accuracy, standard deviation, error propagation, Q-test, confidential limits, graphical methods, reaction kinetics, phase equilibrium and electrochemistry: conductometry, potentiometry and colorimetry.

4.1.2.3 PHYSICS

PHY 2101 - THERMODYNAMICS AND RADIATION

Thermodynamics: Laws of thermodynamics, Carnot cycle, Internal energy and heat engines, Entropy, General thermodynamic functions, Free expansion and throttling process, Phase transformation, Thermoelectricity, Seebeck, Joule, Peltier and Thompson effects. Radiation: Blackbody radiation, Kirchoff's law, Expression for energy density of radiation inside an enclosure, Stefan-Boltzmann law, Wien's distribution law, Rayleigh-Jean's formula, Failure of classical theory, Old quantum theory and Planck's radiation formula.

PHY 2102 - ELECTROMAGNETISM

A.C. Theory: Inductance, Capacitance and Resistance, Use of vectors, Use of complex numbers, Series and parallel circuits, Power dissipation, Quality factor, Simple radio receiver, AC measurement. Electromagnetic Theory: Summary of vector algebra, Gradient, Divergence and Curl, Maxwell's equations in free space, Properties of E.M. waves, Power dissipation, E.M. waves (a) in a conducting medium (b) in an insulator, Dielectric constant.

PHY 2103 -ELECTRONICS I

Junction Diodes: Energy bands in crystals, Intrinsic and Extrinsic semiconductors, Hall effect, p-n Junction, Rectifier and voltage multifier circuits, Diode clippers and clamps, Other type of diodes. Transistor Amplifier Circuits: Junction transistor and its characteristics, Single stage amplifier, Equivalent circuits and analysis, Feed- back multistage amplifiers, Multi vibrators. Oscillators: Basic sinusoidal oscillators and non-sinusoidal oscillators. Operational Amplifiers: Properties and uses of operational amplifiers.

PHY 2204 - PHYSICAL OPTICS

Refraction of Light: Refraction at spherical surfaces, Sign conventions, Theory of rainbow, Prisms, Thin lens formula, Power of a thin lens and of a combination of lenses, Principal points and nodal points, Lens aberration. Interference: Wave nature of light, Superposition of two sinusoidal waves, Interference patterns, Intensity distribution and Mathematical representation, Coherence and incoherence, Fabry-Perot interferometer, Young's double slit, Michelson Interferometer, Fresnel's biprism, Newton's rings and wed films. Diffraction: Fraunhofer diffraction, resolving power of optical instruments, Diffraction gratings, Fresnel diffraction, Zone plate. Polarization: The nature of polarized light, Polarization by crystals, Rayleigh scattering and the colors in the sky.

PHY 2105 - QUANTUM MECHANICS

Introduction: Birth of Quantum mechanics, De Broglie hypothesis, Heisenberg uncertainty Principle, Schrodinger equation, Wave function of a quantum mechanical system, Normalization, Probability density, Expectation values, Eigen functions and Eigen values. Application of the Schrodinger Equation: A particle in an infinite potential well, finite potential step, Rectangular potential barrier, Barrier penetration.

PHY 2106 - ATOMIC AND NUCLEAR PHYSICS

Atomic Spectra: Introduction to 3–D time independent Schrodinger equation, Outline of the solution of the hydrogen atom, Comparison with Bohr theory, Spatial quantization, Larmor precession, Electron spin, Fine structure of spectral lines (L-S coupling), Normal and anomalous Zeeman effect, Selection rules, Stimulated emission. Nuclear Physics: Binding energy and the liquid drop model, Semi empirical mass formula, Fission and fusion, Nuclear reactors, Alpha particle scattering, Radioactive transformations, Secular and transient equilibria, Beta decay.

PHY 2207 - PRACTICAL UNIT

Practical related to second year lectures (e.g. Electronics, Electricity, Sound, Physical Optics etc.)

4.1.2.4 BIOLOGY

BIO 2201 - SYSTEMATIC BIOLOGY

What is systematics, Numerical taxonomy, Phylogenetics/Cladistics, Evolutionary Taxonomy, Species Concepts, Characters in Systematics: Morphological and Biochemical, Animal taxonomy: Zoological nomenclature, Plant taxonomy: History of plant taxonomy, Importance and objectives, Plant identification, Plant classification including briefly the historical development of different systems, Plant nomenclature emphasizing certain areas in ICBN, Field and herbarium techniques, Policies and regulations in field collections, Sources of taxonomic evidence including micro molecules and proteins, Historical development of plant taxonomy in Sri Lanka.

BIO 2302 - PRINCIPLES OF ECOLOGY

Nature of Ecology, Physical Environment, Aquatic environment and terrestrial environment: Soil formation and Soil characteristics; Population Ecology of Single Species: Population size estimation, Population growth, Properties of population; Quantitative population studies, Population growth and life tables; Life history- Age specific mortality, Reproductive effect, Number and size of offspring, Interactions, Competition, Limited resources and competition; Community structure and dynamics; Disturbance and succession, Food chain length and indirect effects, Nutrient cycling and Energy flow, Community dynamics. Landscape dynamics and Human ecology, Analysis of ecological data using statistical software packages

BIO 2203 - GENETICS AND EVOLUTION

Heredity: Early ideas on heredity, Mendelian and non-Mendelian patterns of inheritance, Population genetics, Genetic disorders and genetic counseling, Mutations and cancer, Barr bodies and sex determination, Determination of blood groups, Karyotyping, Translocation and behavior of chromosomes in meiosis, History of evolutionary biology, Concepts in microevolution, Concepts in macroevolution, Human evolution.

4.1.2.5 BOTANY

BOT 2201 - PLANT PHYSIOLOGY

Soil plant atmosphere continuum, components of water potential, challenges in ecohydrology and plant–water relations, mechanisms of stomatal movements, essential mineral nutrients, mechanisms of nutrient absorption, photosynthesis, C3, C4 and cam pathways, source sink relationship, subcellular transport of metabolites, oxidative phosphorylation and electron transport chain mechanisms, proton pumping, inhibitors of ATP synthesis, energetic of the TCA cycle and glucose oxidation, plant growth regulators and movements, signal perception and transduction, phytochromes and phytotrophic signal transductions, physiology of growth and development, physiology of flowering, vernalisation, seed dormancy and germination, fruit ripening, bud dormancy, structure, occurrence and biosynthesis of the plant secondary metabolites, allelochemicals and allelopathy, stress physiology, mechanisms of stress acclimation in plants, climate change and ecophysiology

BOT 2202 - PLANT PATHOLOGY

Introduction to plant pathology, development of diseases in plants, effects of pathogens on plant physiological functions, environmental effects on the development of disease, genetics of plant disease, plant disease epidemiology, methods of attack by plant pathogens, defense mechanisms of plants against plant diseases, diagnosis of plant diseases, control and management of plant diseases, plant diseases caused by fungi, plant diseases caused by bacteria, plant diseases caused by viruses, plant diseases caused by nematodes, plant diseases caused by parasitic higher plants.

BOT 2203 - ECONOMIC BOTANY

Introduction to economic botany, man's association with plants, crop plants and their domestication, centers of origin and distribution of cultivated plants, classification of plants (in general), crop wild relatives, plant breeding and propagation (in general), marketing of crops and crop products, human and animal nutrition, human food and food additives, feed for livestock, food for bees and other desirable invertebrates, timber, wood products and fuel, vegetable fibres, phytochemicals, plant toxins and their applications, human and veterinary medicinal plants, useful ferns, bryophytes, algae, fungi, bacteria and viruses, environmental and social uses, and future role of plants in relation to mankind.

4.1.2.6 ZOOLOGY

ZOO 2201 - ANIMAL HISTOLOGY AND PHYSIOLOGY

Principle types of tissues: Epithelial tissues, Connective tissues, Muscle tissues, Nervous tissues; Structure and histology of organ systems: Digestive system, Circulatory system, Urinary system, Reproductive system, Form & Function: Locomotion, Digestion, Circulation, Respiration; Regulation: sensory and nervous system, Endocrine system, Immune System, Homeostasis, Reproduction: Reproductive strategies of animals: Male and Female reproductive systems, Physiology of human reproduction.

ZOO 2202 - GENERAL ENTOMOLOGY

Characteristics of the Classes of Phylum Arthropoda, Definition of Insecta, Abundance and causes of success, Insect as enemies of man: value of insects to man, methods of injury by insects; External structures of insect body and their functions, Segmentation and body regions, head, thorax and abdomen, mouthparts and their modifications, Sensory organs, Types of antenna and their functions, Body wall and its functions, Wing venation and modifications of wings, Internal anatomy: digestive, respiratory, circulatory, excretory, reproductive, and nervous systems; Metamorphosis, Insect classification. Evolution of insects, Insect collection methods and preservation techniques

ZOO 2203 ANIMAL BEHAVIOUR

Animal behaviour and human society, proximate and ultimate explanations of animal behaviour, testing hypotheses in animal behavior studies, hormones and neurobiology, Learning and cultural transmission, predators and antipredatory behaviour, sexual selection, mating systems, kinship, cooperation, living in groups, foraging, habitat selection, play behaviour, behavior sampling methods, use of specialized software such as UCINET and idTracker.

ZOO 2204 - FISH BIOLOGY

Taxonomy and evolution of fish, common fish species of Sri Lanka, morphometric and meristic characteristics of fish, general anatomy and physiology – digestive system, food and feeding habits, circulatory system, osmoregulation, nervous and endocrine systems, sensory systems; growth and age determination, fish behaviour, reproductive biology and life histories.

4.1.2.7 COMPUTER SCIENCE

COM 2301 - SYSTEMS ANALYSIS AND DESIGN

Systems: Types of organizations, types of systems. Analysis: Requirements gathering methods, Surveys, Questionnaires and interviews, STROBE, Determining System Requirements, validating requirements, User Interfaces, prototyping, Human-Computer Interaction (HCI) considerations, Feasibility study, Preparing Software Requirement Specifications, Use of CASE tools. Design: System modeling and Data modeling, Architectural design, Design patterns, Database, and Processes.

COM 2303 - WEB DESIGN

Introduction to Internet and World Wide Web (WWW): World Wide Web Consortium (W3C), History of the Internet, History of the WWW, History of SGML. HTML: Markup languages, Editing HTML, Common Elements, Headers, Lining, Images, Special characters and more line breaks, Unordered lists, Nested and ordered lists, Tables, Forms, Internal linking, Creating and using image maps, <meta> tags, Frames. Cascading Style Sheets (CSS). Web Page and Site Design: Ease of navigation and maintenance, Reducing page size. Client-Side Processing: Client-side scripting, client-side data validation, Objects, Properties, Events, and Methods. Navigation, Event handling, Forms handling, Hidden Fields, and Images. Server-Side Processing: Server-side scripting, Server-side data validation, Forms handling, and Database access.

COM 2304 - COMPUTER GRAPHICS AND IMAGE PROCESSING

Graphics Systems: Devices, Graphics software. Graphics primitives and attributes: Points & Lines, Line drawing algorithms, Circles, Other curves, Fill areas, Character generation, Colour, Two dimensional transformations: Windowing & clipping: Windowing concepts, Clipping algorithms, Window to view port transformation. Animation: Real time animation, Full animation, In-between. Image Processing: Elements of a digital image processing system: Digitizers, Display & recording devices, Digital image fundamentals: Sampling and quantization, Relationships between pixels, Connectivity. Image Enhancement: Histogram equalization, Smoothing, Sharpening, noise removal. Image segmentation: Edge detection, Boundary detection, Thresholding, Representation and description.

COM 2307 - DATA STRUCTURES AND ALGORITHMS

Asymptotic Notation and Analysis of Algorithms: The definition of O(f(n)), Definition and choice of elementary operation, Determining worst and average-case asymptotic behaviour, Correctness and Efficiency, Expressing algorithms, Growth rates. Data Structures: Containers, Dictionaries, Arrays, Lists, Lined lists, Stacks, Queues, and Trees. Sorting algorithms: Insertion, Selection, Merge, Quick, Bubble and Heap sort Algorithms, Comparison of properties of the different algorithms Searching algorithms: Binary search, Fibonacci search. Hash tables: Choosing hash functions, Collision resolution 26 techniques including open addressing, linear and quadratic probing, and chained addressing Linked lists: Dynamic implementation of lists, inserting and deleting nodes, singly and doubly linked lists, header nodes, and pass-by-reference parameters Stacks and queues: Pointer and circular array implementations, applications Trees: Non-linear data structures, terminology, general trees, binary search trees, inserting and deleting nodes, pre/in/post-order traversal Priority queues: Definition and implementation, heaps Graphs: Terminology, undirected vs directed graphs, weighted graphs, adjacency matrix vs adjacency list representations, depth/breadth/best-first traversals.

COM 2308 - SOFTWARE ENGINEERING

Scope of Software Engineering: Software crisis, Software engineering objectives, Software Development Life Cycle. Software Process Models: Waterfall model, component-based Software Engineering, Spiral Model and Prototyping, Extreme Programming, Rational Unified Process, and Agile Technology. Non-functional Requirements: Software Systems, Properties of Software Systems, socio-technical systems, Reusability, Portability, Interoperability, Maintainability, Usability, Safety, Security and Efficiency. Functional Requirements: Use–Case modeling, Use-Case Descriptions, Activity Diagrams and Entity Classes. Requirement Specification: Requirement analysis, Specification documents. Design Techniques and software architectures: Cohesion, Coupling, Sequence diagram, Collaboration diagram and detailed class diagram, software design frameworks, Computer Aided Software Engineering (CASE), introduction to design patterns, introduction to web services and service oriented architecture. Software Implementation: software engineering best practices, Testing: White Box testing, Black Box testing, test case generation, Software Inspection, Unit, Integration and Acceptance testing, Regression testing. Software Quality: Software matrices and Measurements, Structured and Object-Oriented Approaches. Current topics: emerging software engineering concepts.

4.1.2.8 MATHEMATICS

MAP 2301 – ALGEBRA

Sets. Propositions and truth values, Logical connectives, Truth tables, Quantifiers, Relations, Mappings, Euclidean algorithm, Greatest common divisor, Least common multiple, Linear Diophantine equations and linear congruence, Introduction to Groups, Cyclic Groups, Permutation Groups, Homomorphism, Kernal of Homomorphism, Isomorphism, Automorphism, Introduction to Fields.

MAP 2202 – REAL ANALYSIS II

Series: Infinite series, Test for convergence and divergence, Power series, Riemann integral, Improper integral. Functions of Several Variables: Partial differentiation, Chain rule, Differentiation under the integral sign, Maxima and minima, Lagrange's Method of multipliers for maxima and minima, Multiple integrals, Change of variables in integrals: Jacobian inverse and implicit function theorems, Iterated integrals, Introduction to Metric spaces.

MAP 2203 – DIFFERNETIAL EQUATIONS II

Series solution, Picard iterates, Existence and uniqueness of solution, Linear systems, Eigen vector method, Fundamental matrix solutions. First `Order Partial Differential Equations: Linear equations, Non-linear equations, Characteristics. Second Order Partial Difference Equations: Equations with constant coefficients, Equations with variable coefficients, Laplace equation, Wave equation, Diffusion equation, Use of Fourier series.

MAP 2204 – COMPLEX CALCULUS

Introduction: Basic Definitions, Geometric Interpretation of complex numbers, Basic properties. Functions of Complex variables: Limit, Continuity, Analytical functions, Cauchy Riemann equations, Cauchy's theorem, Cauchy' s integral formulae, Taylor series, Singular points, Laurent's series, Cauchys Residue theorem, Evaluation of real valued integrals.

MAA 2201 – MATHEMATICAL METHODS II

Orthogonal Curvilinear Coordinates: Co-ordinate surfaces, Co-ordinate curves and related unit vectors, Elements of arc length, Area and volume, Cylindrical polar coordinates, Spherical polar coordinates, Line integrals, Surface integrals, Volume integrals. Laplace Transforms: Definition and basic results, Elementary properties, Inverse laplace transforms and its properties, Convolution theorem, Laplace transform of special functions, Evaluation of integrals, Solutions of ordinary differential equations using Laplace transforms, L-R-C Circuits, Solutions of partial differential equations using Laplace transforms, Fourier sine/Cosine series. Fourier Transforms: Infinite fourier Sine/Cosine transforms and their inverse formulae, Finite fourier Sine/Cosine transforms and their inverse formulae, Solution of boundary value problems using Fourier transforms.

MAA 2302 – PROBABILITY AND STATISTICS II

Probability Distributions: Joint distribution of two or more discrete or continuous random variables, Marginal distribution, Conditional distribution. Random Variables: Independence of random variables, Expectation, Conditional expectation, Covariance, Correlation coefficient, Transformation involving two or more random variables, Probability density functions of sum, Difference, Product, Quotient of two random variables, Random samples. Order Statistics: Distributions of Min Xi, Max Xi. Distributions of X, S2, t, F, □2 distributions and their properties, Central limit theorem. Estimation and Testing Hypothesis: Point estimation, Properties of estimators, Unbiasedness, Consistency, Relative efficiency, Efficiency, Sufficiency, Factorization theorem, Rao-Blackwell theorem, UMVUE, Exponential families, Cramer-Rao inequality, Methods of obtaining estimators: Method of moment, Maximum likelihood estimator, Interval estimation: Confidence intervals for μ, σ^2, ρ, σ_1^2/σ_2^2 under various assumption, Tolerance limits, Neymann-Pearson lemma.

Distribution of Random Variables: Introduction, The probability set function, Random variables, The probability density function, The distribution function, Mathematical expectation, Chebyshev's inequality. **Conditional probability and stochastic independence:** Conditional probability, Marginal and conditional distributions, The correlation coefficient. **Some special distributions:** The Binomial, Trinomial and Multinomial distributions, The Poisson distribution, The Gamma and Chi-Square distributions, The Normal distribution, The Bivariate normal distribution. **Distributions of functions of random variables:** Sampling theory, transformations of variables of discrete and continuous types, The t and F distributions, Extensions of the Change-of-variable technique, Distributions of order statistics, The Moment generating function technique, The distributions of $\overline{X}$ and nS^2/σ^2, Expectations of functions of random variables. **Limiting distributions:** Stochastic convergence, Limiting Moment-generating functions, The Central limit theorem.

MAA 2203 – NUMERICAL ANASLYSIS II

Interpolation and prediction, Gaussian integration, Singular integrals. Differential problems of higher order, Min-Max polynomial approximation, Approximation by rational functions, Quotient difference algorithm, Sturm sequences, Splines, Over determined systems, Boundary value problems. Numerical Integration Quadrature formulae Monte Carlo Method, Numerical methods of solving Cauchy's Problem for ordinary differential equations. Applications to difference equations.

MAA 2204 – LINEAR PROGRAMMING

Introduction. Convex analysis and polyhedral sets, LP in 2D space, General LP problems, Basic feasible solutions, Optimal solutions, Simplex method, Simplex tableau, Artificial variables, Degeneracy, Revised simplex method, Duality in LP problems, Duality theorems, Dual simplex method, Sensitivity analysis.

4.1.2.9 HEALTH PROMOTION

HPT 2301 - PSYCHOLOGY & HUMAN BEHAVIOUR

Introduction to psychology. Specific branches of psychology. Social psychology and humanistic psychology. Examining the work of psychologists. Health behaviour and its modifications. Socio-psychological models which help to interpret health behaviour.

HPT 2202 - WORKING WITH COMMUNITIES

Working with 'target' populations. Ethics of influencing decisions. Creating a milieu that facilitates health development. Facilitating self-examination and questioning. Recognizing readily achievable and less readily achievable goals. Participatory methods. Recognizing sensitive indicators of progress. Record keeping and retrieval. Assessment of long term progress. Community control of information and records.

HPT 2103 - PRINCIPLES OF EVALUATION

Purpose of evaluation. Monitoring vs. evaluation. Types of evaluation, strength and limitations. Planning and implementing process. Effectiveness and cost effectiveness of interventions. Expected and unexpected impacts. Dilemmas of evaluation.

HPT 2104 - INTRODUCTION TO EPIDEMIOLOGY

Importance of the population perspective in epidemiology. Strengths and weaknesses of the various methods of epidemiological data collection. Measurement of health and disease. Routine sources of epidemiological data. Interpretation of epidemiological studies.

HPT 2205 - STRUCTURAL DETERMINANTS OF HEALTH

Structural determinants of health. Structural determinants of individual's and group or community's wellbeing. Readily discoverable determinants and covert determinants. Analysis of structural determinants. Principles of prioritizing among different determinants.

HPT 2206 - INDICATORS AND MEASUREMENTS OF COMMUNITY HEALTH

Indicators for needs assessment. Indicators for monitoring and evaluation. Process, outcome and impact indicators. Applications to day today health promotional efforts, formal and informal interventions. Development of indices as a tool in health promotion. Community ownership of health promotion and its measurement. Ethics of intervention and measurement.

HPT 2207 - HEALTH IMPROVEMENT

Obstacles to health improvement. Evident and hidden obstacles. Recognizing personal or individual impediments to improving wellbeing. Recognizing external impediments to improving wellbeing. Addressing obstacles to health improvement.

HPT 2208 - EARLY CHILDHOOD CARE AND DEVELOPMENT (ECCD) AND MATERNAL AND CHILD HEALTH (MCH)

Early child hood period. Growth, development and survival. Promotion of maternal and child health. Determinants of child and maternal morbidity and mortality. Child and maternal health care services.

BIO 2204 - ECOLOGY

Dynamics of Ecosystems: Introduction, Objectives, Ecosystem concept, dynamics of biotic components, Characteristics of ecosystems, productivity (primary productivity and feeding relationships, Food chains, Food web), Trophic levels, Ecological pyramids (pyramid of numbers, pyramid of biomass, energy pyramids), The nature of energetics, Laws of thermodynamics, Energy flow through ecosystems, Role of raw materials in the ecosystems (the hydrological cycle, gaseous cycle, sedimentary cycles). Habit and Niche: Introduction, Objectives, Habitat, History and definition of niche, The hypervolume model, Niche interactions (parameters of the niche, niche overlaps and factors affecting the niche and its parameter), Niche dynamics, Tolerance limits, Tolerance curves. Populations: Characteristics and growth. Population Interactions: Symbiosis, Competition, Predation, Herbivory, Parasitism, Pathogenicity and Commensalism. Population Dynamics: Population regulation.

FIELDWORK

HPF 2201 - APPLYING MEASURES TO IMPROVE HEALTH STATUS OF STUDENT GROUPS

Selection of an applicable group/s to promote wellbeing. Developing a mutual partnership with the selected group/s. Application of effective activities to improve health status of selected group/s. Monitoring the process. Assessing value systems among groups and its implications.

HPF 2102 - INTRODUCTION TO FIELD SETTINGS

Identifying structures and key functions of different settings available in the community. Recognizing the key persons in the communities. Formal and informal settings. Working across different disciplines and sectors.

HPF 2103 - ENGAGEMENT OF COMMUNITIES

Building mutual relationships with the community. Use of existing links and use of new links. Developing skills among students to develop dialogues with people. Mechanism of initiating a health promotion process. Working in mutually respecting relationship with varied groups.

HPF 2204- CLARIFYING HEALTH ISSUES WITH ASSIGNED COMMUNITIES

Identifying visible and less visible health issues in the community. Assessing the health status and needs of individuals and communities. Recognizing felt and normative needs. Transforming normative needs into felt needs among community. Prioritizing the health issues with the community using appropriate strategies.

HPF 2105- DEVISING MEASURES OF HEALTH IN PARTNERSHIP WITH COMMUNITIES

Developing objectives together with the community. Identification of measures those are applicable to assess community health. Recognizing qualitative and quantitative measures. Designing applicable measures with the partnership of communities relevant to selected health issues.

HPF 2106 - ASSESSING CHANGES IN HEALTH STATUS OF STUDENT GROUPS

Continuation of effective activities to improve health status of selected group/s. Developing a suitable design to assess the changes in own group and selected group/s.

HPF 2207- CLARIFYING STRUCTURAL DETERMINANTS OF HEALTH WITH COMMUNITIES

Identifying and prioritizing factors affecting for prioritized health issues with the community. Analyzing the identified determinants. Readily discoverable determinants and covert determinants. Social norms and other influences operating in the community. Planning methods to identify and prioritize determinants with the community.

HPF 2208- ENGAGING STRUCTURAL DETERMINANTS OF HEALTH OF COMMUNITIES

Designing activities together with community to address prioritized determinants. Implementing the planned activities. Identifying and addressing new factors which are recognized during the above process. Developing objectives and indicators to monitor the progress together with the community.

HPF 2109- MONITORING PROGRESS OF COMMUNITIES

Developing indicators to monitor the progress. Community ownership of assessing changes. Analysing the changes.

HPF 2110 - CLARIFYING OBSTACLES TO PROGRESS WITH COMMUNITIES

Identification of obstacles to progress with partnership of community/communities. Community participation to clarify obstacles. Internal and external obstacles. Visible and invisible obstacles.

4.1.2.10 INFORMATION AND COMMUNICATION TECHNOLOGY

ICT 2301 – DESIGN AND ANALYSIS OF ALGORITHMS

Introduction: What is an algorithm, Characteristics of algorithms, Time and Space complexities, Asymptotic notations, Devising and expressing algorithms. Algorithmic techniques: use and removal of recursion; validation, analysis, Greedy Method, Divide and conquer, Backtracking, Dynamic Programming, Branch and Bound, Symbol Table Algorithm, Job sequencing. Searching and sorting techniques: Bubble sort, Merge sort, Quick sort, Insertion sort, Selection sort. Binary search, N-queen problem, optimal binary search trees, Hashing algorithms, Huffman code, Convex hull. Knapsack problem: sum of subsets knapsack problem, O/I knapsack problem. Tree Algorithms: binary trees, Breadth-first and Depth-first search in tree traversal, threaded AVL.

ICT 2402 – SOFTWARE ENGINEERING

Introduction to Software Engineering: Software crisis, Software engineering objectives, Software Development Life Cycle. Software Process Models: Waterfall model, component-based Software Engineering, Spiral Model and Prototyping, Extreme Programming, Rational Unified Process, and Agile Technology. Non-functional Requirements: Software Systems, Properties of Software Systems, socio-technical systems, Reusability, Portability, Interoperability, Maintainability, Usability, Safety, Security and Efficiency. Functional Requirements, Requirement Specification: Requirement analysis, Specification documents. Design Techniques and software architectures: Cohesion, Coupling, Sequence diagram, Collaboration diagram and detailed class diagram, software design frameworks, Computer Aided Software Engineering (CASE), introduction to web services and service-oriented architecture. Software Implementation: software engineering best practices, Testing: White Box testing, Black Box testing, test case generation, Software Inspection, Unit, Integration and Acceptance testing, Regression testing. Software Quality: Software matrices and Measurements, Structured and Object-Oriented Approaches. Current topics: emerging software engineering concepts.

ICT 2403 – GRAPHICS AND IMAGE PROCESSING

Overview of Graphics Systems: Video Display Devices, Raster-Scan Systems, Vector Systems, Graphics Monitors and Workstations, Input Devices, Hard-copy Devices. Output Primitives: Points and Lines, Line-Drawing Algorithms, Circle- Generating Algorithms, Filled-Area Primitives. Geometric Transformations: Basic Transformations (Translation, Rotation, Scaling, Reflection, Shear), Matrix Representations and Homogeneous Coordinates, Composite Transformations (General Pivot-Point Rotation, General Fixed-Point Rotation, General Scaling Directions), Transformations between Coordinate Systems, colour/gray-scale transformations, Introduction to Three-Dimensional Geometric Transformations. Two-Dimensional Viewing: The Viewing Pipeline, Viewing Coordinate Reference Frame, Window-to-Viewport Coordinate Transformation, Clipping Operations: Point Clipping, Line Clipping, Polygon Clipping.

Image Processing: Elements of a digital image processing system: Digitizers, Display and Recording devices. Digital image fundamentals: Sampling and quantization, Transformation between raster & vector systems, Image compression, Relationships between

pixels, Connectivity. Image Enhancement: Histogram equalization, Smoothing, Sharpening, Noise removal, Projection. Image Segmentation: Edge detection, Boundary detection, Thresholding, Representation and description. Image Matching.

ICT 2404 – MULTIMEDIA AND WEB TECHNOLOGY

Introduction to Multimedia, Multimedia Applications. Multimedia Compression: Hardware that enables multimedia, multimedia file types, their features and usage, Basic data compression techniques, Graphic compression, Audio compression, Video compression Media Composition: Text and graphic editors, Sound editors, Video editors. Media Integration: Interactive audio, Interactive video, Authoring multimedia, multimedia on the Internet, streaming, webcasting, Social and Legal issues. Web Development: HTML, CSS, XML, database integration, client-side scripting using JavaScript, server side scripting using PHP, Ajax, session handling, cookies.

ICT 2305 – COMPUTER NETWORKS

Introduction to Computer Networks, Classification of Computer Networks, ISO-OSI and TCP/IP Architecture. Data Communication and Transmission: Introduction to data transmission, Properties of signals, Time and frequency modulation techniques, Asynchronous and synchronous transmission. Transmission Media: Twisted pair, Coaxial cable, Optical fiber, Terrestrial microwave, Satellite microwave, Radio wave. Transmission and Switching: Frequency division and time division multiplexing, Circuit switching, Packet switching. Error Detection and Correction Techniques: Parity checks, Cyclic Redundancy Checks (CRC), Hamming code. Framing: Character count, Character stuffing, and bit stuffing. Protocols: Stop and wait protocols, Sliding window protocols, Network topologies and standards, Internetworking, Connectionless and Connection-oriented services, Datagram delivery, CSMA/CD, Token Ring, Token Bus, VLANs, Wi-fi, Wi-Max, Bluetooth. Network components: Switches, Routers, servers, structured cabling. Internet Protocols: IP, ICMP, TCP, UDP, Routing and Routing algorithms, ARP and RARP Building routing tables, CIDR, DNS.

ICT 2406 – INTERNET PROGRAMMING

An introduction to Internet: IPv4/IPv6. Internet Applications, World Wide Web, VoIP, VPN concept, HTTP, FTP and TELNET. Electronic Mail: SMTP, Mail Access Protocols (POP3, IMAP), Web based e-mail; Internet Programming: An introduction to Sockets, Socket Programming with TCP, Java, Client/Server computing, RMI and distributed computing. Streaming: video and audio streaming.

ICT 2207 – MANAGEMENT INFORMATION SYSTEMS

Organizations, Management, and the Networked Enterprise: Information Systems in Global Business Today, Global E-Business, How Businesses Use Information Systems, Information Systems, Organizations, and Strategy, Ethical and Social Issues in Information Systems; Information Technology Infrastructure: IT Infrastructure and Emerging Technologies, Foundations of Business Intelligence: Databases and Information Management, Telecommunications, the Internet, and Wireless Technology Securing Information Systems; Key System Applications for the Digital Age: Achieving Operational Excellence through Enterprise Applications-Commerce: Digital Markets, Digital Goods, Managing Knowledge, Enhancing Decision Making.

ICT 2408 – COMPUTER ORGANIZATION AND ARCHITECTURE

Introduction: Organization and Architecture, Structure and Function, Von Neumann Architecture and Harvard Architecture. The Computer System: Computer Components, Interconnection Structures, Bus Interconnection. Processor Organization and Function: CPU registers, Instruction fetch and execute, Instruction format, Instruction execution, Interrupts, Interrupts and the instruction cycle, Control Unit, Microprogrammed Control. Computer Memory System: Characteristics of memory systems, The memory hierarchy, Cache memory, Internal memory, External memory. Input/Output System: I/O modules, Programmed I/O, Interrupt-driven I/O, Direct memory access, storage systems, RAID. Overview of Advanced Architecture: Pipelining, RISC architecture, Superscalar/VLIW architectures. Assembly Language Programming: instruction sets of different microprocessors, writing assembly programmes.

ICT 2209 – COMMUNICATION SKILLS

Introduction to communication skills: Importance of communication skills, Communication process, Downward communication, Upward communication, Horizontal communication, One-way communication, Two-way communication, Multi-directional communication, Effective communication and barriers for communication, Forms of communication: Oral communication, Written communication, Non-verbal communication, Para-language code, Signals, Symbols, Gestures, Sign language, Levels of communication: Inter personal communication, Public communication, Public speaking, Major components of communication, Communication for coordination and management, formal letters, notices, memos, fax messages, email etc., Motivation: Intrinsic motivation and extrinsic motivation, Leadership & personality development: Leadership: Supportive leadership, Directive leadership, Achievement oriented leadership & participative leadership, Conversations: Face to Face Conversation - Telephone techniques – Role play activities (Students take on roles and engage in conversation) Group discussions, Language skills: Receptive skills (Listening and reading), Productive skills (Speaking and writing), Grammar (Language structure), Use of language effectively & accurately, Skimming & scanning, Presentation skills: Power point presentation, Body language, Visual aids, Pronunciation, Eye contact, Facial expression, Clarity, Audibility, Fluency, Relevance, Voice control, Accuracy, Meeting management: Developing meeting goals, make agendas, minutes, notices, selecting office bearers, conducting meetings, seminars, workshops, conferences, Interview skills: Preparing for interviews, Facing interviews, Resume preparation, covering letter, letter of recommendation, service certificates, testimonials, Note taking (reference), summary, editing, academic writing, publishing, writing articles to newspapers, magazines and journals, report writing, project proposals & research proposals, newsletters, Use of communication technology appropriately and effectively (Computer, internet, web sites, multimedia, e-learning, electronic library).

4.1.3 THIRD YEAR PROGRAMME OF STUDY

4.1.3.1 INTERDISCIPLINARY COURSES

IDC 3201 - ENTREPRENEURSHIP DEVELOPMENT

Introduction to business, the challenge of entrepreneurship, developing successful business ideas, feasibility analysis, selecting the form of ownership, building the business plan, creating a solid financial plan, managing cash flow, building a marketing plan.

IDC 3202 - STANDARDS AND QUALITY MANAGEMENT SYSTEMS

Introduction, Evolution of Quality Management Systems, application of Quality Management Systems, Type of Industries, Sri Lankan Food and Beverage industry, Available Quality standards for Sri Lanka food and beverage industry, legal and legislative framework for Local Food Industry, Accreditation process and accreditation bodies, type of audits, Quality management systems and benefits

4.1.3.2 CHEMISTRY

CHE 3201 - INDUSTRIAL INORGANIC MATERIALS

Glass Industry: Raw materials and manufacture of glass; Chemistry involved in the production of glass; Types of glass; Glassy state phenomena and annealing of glass; Production of safety glasses, thermodynamics of glass formation, kinetics of crystallization and glass formation; Heat treatment of glasses, general properties and their applications. Ceramics Industry: Raw materials used in the ceramic industry; Chemistry involved in the production of ceramic articles and wares; Types and classification of ceramic products; Manufacture of ceramic products, purpose and methods of glazing. Cement Industry: Raw materials used for cement production; Chemistry involved in the production of cement; Manufacture of cement by wet and dry processes; Types of cement and composition of clinker. Chemistry involved in the setting and hardening of cement and quality control in cement. Gem minerals: Optical properties: polarization, refraction, chemical characteristics, colour in gemstones. Dispersion, 'fire' and diffraction, colouring elements; allochromatic and idiochromatic materials. Origin of colour in gem materials; luminescence; Pleochroism; the dichroscope, Absorption spectra: alexandrite, emerald, enstatite, peridotite, Sin halite, ruby, blue sapphire; analytical techniques for gem testing; Artificial and synthetic gems and different treatment methods of gems. Ilmenite and extraction of TiO_2. Graphite: Characteristic properties of graphite, chemical composition, structure, flake graphite, vein graphite and amorphous graphite, world market of natural graphite. Spectroscopic techniques for identification, Applications: pencil, crucible, batteries, lubricants, paints etc. Synthetic graphite, Value addition to graphite in Sri Lanka: graphene technology. Fertilizers: Raw materials, types of fertilizers, nitrogenous, phosphates, potassium and mixed complex fertilizers, manufacturing processes - phosphate rocks as raw material for manufacturing P-fertilizer, super-phosphates, rhenania-phosphates, ammonia, urea. Industrial pollutants and industrial safety.

CHE 3202 - ADVANCED BIOCHEMISTRY

Enzymes: function, modes of catalysis, Michaelis-Menten kinetics, inhibition (competitive, non-competitive, uncompetitive), analysis of kinetic data (Lineweaver-Burke and Eadie-Hofstee plots), kinetics schemes for two-substrate enzyme reactions. Transport across membranes - mechanisms and energetics. Metabolism: overview, role of ATP, role of cofactors in certain reactions (explained as needed); use of isotope labelling in studying metabolic pathways; glycolysis, citric acid cycle, respiration, pentose phosphate pathway, gluconeogenesis, glycogen metabolism, photosynthesis, fatty acid biosynthesis, beta-oxidation of fatty acids, outline of amino-acid biosynthesis and degradation. Central dogma of Biology: overview of the process of translating DNA coded information into proteins. Basic separation techniques in Biochemistry: methods of disintegration of tissues/cells, separation of sub-cellular organelles, solvent and salt precipitation, paper & thin layer chromatography; column chromatography - molecular sieving, affinity, ion exchange; electrophoresis with some practical applications and ultracentrifugation.

CHE 3203 - CHEMISTRY OF POLYMERS

Polymer Structure: Definition of polymer, difference between polymers and macromolecules, classification of polymers, degree of polymerization, nomenclature and tacticity, basic structure of polymers (linear and branched polymers; moderately cross linked polymers), molecular forces and chemical bonding in polymers. Physical chemistry of polymers: Number average, molecular weight average, Z-average and viscosity average molecular weight, distribution of molecular weight, determination of molecular weight by end group analysis, osmotic pressure measurement, light scattering, viscosity measurement, Mark-Houwink-Sakurada relationship, Huggins and Kramer equation, polymer solutions, concept of solubility parameters, Flory-Huggins Theory, theta conditions and temperature, amorphous and crystalinity, determination of thermal transitions. Polymerization: Types of Polymerization - (a) Step-growth (condensation) polymerization: Mechanism and kinetics of stepwise polymerization, polydispersity index, statistic molecular weight control, (b) Radical chain (addition) polymerization: Mechanism, initiation, propagation, termination, kinetics and thermodynamics of radical polymerization, radical life time, degree of polymerization and chain transfer, ceiling temperature, (c) Cationic and ionic polymerization: similarities and contrasts in ionic polymerization, mechanism and kinetics of cationic anionic polymerization, living polymers; Radiation and photo-polymerization. Preparation, Properties and Uses: Phenol-formaldehyde resins, melamine-formaldehyde resins, urea-formaldehyde resins, epoxy resins, polyester polyamide, polyethylene, PVC, polystyrene, polyesters, polycarbonates and polymethyl methacrylate. Biological Polymerization: Introduction, nucleic acid, protein, enzymes, silk, wool, collagen, biopolymer from renewable resources, polysaccharide, starch, chitin/chitosan and alginate. **Polymer Technology**: Fibers - Introduction, production, textile fibers, Natural fibers; Plastic: overview, processing, thermoset/thermoplastic and polymer blends. **Chemistry of Natural rubber**: Latex collection & purification, materials used in rubber product manufacture and compounding of dry rubber, chemistry of other important rubbers such as neoprene, butyl rubber, nitrile rubber, synthetic rubbers and elastomers; Vulcanization (crosslinking) of rubber (vulcanizing agents and systems), effect of temperature and time on cross-linking, types of crosslinks and relevance to properties; Measurement of cure characteristics and Vulcanizate properties.

CHE 3204 - FOOD CHEMISTRY

Water in food dispersed systems (structure of water and its physical properties, water activity, properties of solutions, moisture sorption, water diffusion, capillary condensation and phase transition). **Amino acids, peptides and proteins** (denaturation of proteins, solubility and water binding, emulsifying, foaming & gelation, viscosity, texturization & fiber formation; extrusion), ninhydrin reaction, essential amino acids, curd formation and buffering action of proteins. **Carbohydrates and their functional properties** (crystallization, muta-rotation, caramelization, gelation, polyols and properties, starch and modified starch, hemicelluloses, pectosans & cyclodextrins, pectines, dietary fibers). **Lipids** (nomenclature and classification of saturated and unsaturated fatty acids, physical and chemical properties, chemical reactions, lipid oxidation and role of antioxidants). Fatty acids and triglycerides, analysis of oils and fats, sources and extraction of oils and fats, fat splitting techniques, oils and fats in the food industry, manufacture of margarine, mayonnaise and ice cream, physical aspects of emulsions, solubilization and stabilization. **Vitamins** (classification of fat-soluble and water soluble vitamins, biological role, requirement, occurrence, stability, degradation). **Enzymes** (isolation and nomenclature, catalysis, specificity, structure, enzyme cofactors, enzyme kinetics, factors influencing enzyme reactions, food modification by enzymes, immobilized enzymes in food processing). Minerals (Uses of main elements sodium, potassium, magnesium, calcium, chlorides and phosphorus. **Food additives** (chemistry of food additives: antimicrobial agents & antioxidants, acids and bases, chemical leavening systems, buffer systems and salts, chelating agents and their functions). **Food flavours** (different tastes, natural compounds & their chemistry, artificial sweeteners and their activity). Food Analysis (determination of moisture content, ash, protein, amino acid profile, fat, fatty acid composition, saponification number, iodine number, carbohydrates, energy).

CHE 3205 - ADVANCED INROGANIC CHEMISTRY I

Electronic Spectra of Coordinated Complexes: Energy levels of atoms, Russell Saunders coupling, fine structure, Zeeman and Stark effect; Ligand Field Theory - Molecular Orbital Theory, Orgel diagrams; Electronic spectra of transition metal complexes - spectroscopic terms, selection rules for electronic spectra of transition metal complexes, structural effects; Inorganic reaction mechanisms: Electron transfer reactions between octahedral complexes - inner-sphere & outer-sphere mechanisms and non-complementary electron transfer reactions. **Oragnotransition Metal Chemistry**: Introduction: Fundamentals for the organometallic chemistry - concepts of electronegative, electropositive, electron density, electron rich and electron deficient, Lewis dot structures and valences electron counts, trends in periodic table and general trends in periodic table, metal catalysis definition and function; Importance of organotransition metal chemistry, classification of ligands according to the number of electrons donated; The 18 and 16 electron rule, coordinative unsaturation; oxidation state formulation; Hapticity (ηn), geometry of transition metal complexes vs coordination number and electron configuration (dn); Metal-Ligand bonding: Ligands include CO, N_2, olefins, acetylenes, NO, group VB donors, isocyanides, carbenes, carbynes, allyls, cyclobutadienes, cyclopentadienes and benzene; Magnetic properties: types of magnetic behaviour; spin-only formula; Magnetic susceptibility, coupling, correlation of μ_s and μ_{eff} values; Electronic spectra of transition metal complexes. **Catalysis and Reaction Mechanisms of Organotransition Metal Complexes**: Reactive patters: Oxidative additions, insertion reactions-migratory insertions of ligands, reductive elimination, association, dissociation, substitution, elimination (α, β, γ, δ, ε) and oxidative coupling; Reactivity of coordinated ligands - electrophillic and nucleophillic attack; **Homogeneous Catalysis**: General remarks, olefin isomerisation, olefin hydrogenation, hydroformylation reaction, Monsanto acetic acid synthesis, water gas shift reaction, hydrosilation and hydrocyanation of unsaturated compounds, hydration of alkenes, polymerization of olefins, olefin metathesis.

CHE 3206 - CHEMICAL AND PROCESS TECHNOLOGY

Overview of Chemical industry: Role and Development of the Chemical Industry; Characteristics of the Industry: World's major chemical industries and their research and development, organizational structures, technological economics. Requirements to establish a chemical industry. **Theory of chemical Industry**: Thermodynamics and chemical kinetics of industrial processes. Stoichiometry, extent of a chemical reaction, conversion, yield and selectivity; Complex flow sheets: Mass and Energy transfer. Ficks laws of diffusion and their industrial application. Reactor theory. Batch reactor, continuous stirred reactor (CSTR), Plug flow reactor (PFR) and Hybrid reactors. **Industrial Catalysts**: Homogeneous and heterogeneous catalysts and their industrial applications, poisoning of catalysts, Theory of Industrial reactor designs. Current advances in chemical industry. Next generation industry: Theoretical aspects of reactor disasters, Industrial safety and Environmental protection. Green industrial technology.

CHE 3207 - ELECTROCHEMISTRY

Dynamic electrochemistry: Concepts of equilibrium potential, Polarization and over potential; concentration and activation polarization, polarizability of the interface, equilibrium exchange current density, rate of electron transfer, effect of potential, Corrosion and the Stability of Metals: Mechanisms of corrosion, thermodynamics of corrosion and the stability of metals, pourbaix diagrams; Ni-H_2O, Fe-H_2O and Al-H_2O systems; Kinetics of corrosion: Corrosion current and corrosion potentials, mixed potential theory of corrosion; Uses of Evan's diagrams for understanding of corrosion: Corrosion reaction under cathodic control, corrosion reaction under anodic control, corrosion reaction under diffusion control, passivation. Determination of rate of corrosion by corrosion current; Corrosion of different forms: Galvanic corrosion, crevice corrosion, pitting corrosion, erosion corrosion, stress corrosion, hydrogen damage, corrosion control methods; Inhibitors: anodic, cathodic and mixed inhibitors, Cathodic protection: sacrificial anode method, impressed current method; Anodic protection: Galvanic protection and impressed current protection. Electrochemical Energy Storage and Energy Conversion devices: Terminology related to energy conversion and storage: Primary, secondary and fuel cells; Primary batteries: Examples for them; Secondary batteries: lead acid battery etc., lithium batteries, nickel cadmium batteries, thermodynamic of batteries; Fuel cells: hydrogen oxygen cell, hydrogen air cell, bio-enzymatic fuel cells. Photo Electrochemical (PEC) cells, photovoltaic cell of first, second, third and fourth generation, hybrid solar cell. Electrochemistry in Industry: **Industrial electrolysis and electrosynthesis**; Chloro alkali process, metal extraction, metal finishing electrodialysis and its applications. Electrocatalysis and electrosynthesis; hydrogen oxidation and oxygen reduction reactions, electrocatalytic hydrogenation, rechargeable and non-rechargeable batteries, corrosion reactions, water electrolysis, electrosynthesis of selected organic compounds. Electrodeposition; current efficiency, deposit thickness, atomistic aspects of electrodeposition, pulse deposition techniques, Electroplating: Requirements for electroplating, mechanism of electrtroplating. Electro-polymerization; Polyaniline, polythiophene, applications of conducting polymers. Electrochemical technology in water treatment: The advantages and limitations of electrochemical technology; Metal ion removal from process solutions, regeneration of chromic acid electroplating baths; Electro coagulation technique for the removal of excess fluoride and hardness in water.

CHE 3208 - ENVIRONMENTAL CHEMISTRY

Atmospheric Environmental Chemistry: Composition and structure of atmosphere; Chemistry of the stratosphere and troposphere, both in the gas phase and in and on particles; Formation of aerosols; Sources, transport, and fate of pollutants; Lifetimes of chemical compounds, radicals and radical families; Gas phase and heterogeneous chemistry; Atmospheric circulation and its implications for the transport and mixing of atmospheric pollution; The climate system including discussion of the greenhouse gases, both natural and anthropogenic; Effects of air pollution on climate, water and soil. Sampling and analytical techniques for air. **Aquatic Environmental Chemistry**: The dissolved CO_2 system in natural waters, alkalinity, total C, buffering, alkalinity and titrations, precipitation and dissolution, mineral solubility and the Gibbs phase rule, complexation, redox reactions, pe and Eh, Water quality parameters, sampling of water, health aspects of pollution of water, analytical techniques for water quality; Interaction with soil (agricultural soil pollution and eutrophication) and measurements in water pollution; Irrigation water quality: Salinity/electrical conductivity, Na absorption ratio (SAR), effect of adjusted sodium absorption ratio, adjusted RNa and the permeability of soil and levels of Cl^-, carbonates, nitrates/N, sulphates, borates and phosphates. **Environmental Soil Chemistry**: The classification of common pollutants in soils. Soil pollution in relation to soil functioning, fate and effects of pollutants in soil environments. Detailed insight into the chemistry of soils including specific surface of soil minerals, surface charge of soil minerals, chemistry of soil organic matter, soil solution-solid phase equilibrium, sorption phenomena on soils, bioavailability, Ion exchange process, reaction at limited sites, bioavailability, degradation, transport and biological/toxicological effects in soil. Introduction to Biogeochemistry: Biogeochemistry in Freshwater; Wetlands lakes and Oceans; Primary production and nutrient cycling in lakes, lake budgets, and climatic change, aquatic; The basics redox reactions in natural environments.

CHE 3209 - NATURAL PRODUCTS CHEMISTRY

Introduction to Natural products: Chemically active natural compounds, Natural sources and uses, Naturally derived medicines. **Carbohydrates**: Classification, structures and reactions of monosaccharides, disaccharides, polysaccharides. **Amino Acids, Peptides and Proteins**: classification, Zwitterion, Levels of protein structure, reactions of amino acids, peptides, structure elucidation of peptides, N-terminal identification, Carboxy terminal identification, Synthesis of Amino Acids. **Terpenes:** classification and biosynthesis of terpenes, reaction, formation of geranyl pyrophosphate, farnesyl pyrophosphate and squalene. **Steroids:** introduction, types of steroids, corticosteroids, estrogens and progestogens, androgens, synthetic steroid, biosynthesis of cholesterol, vitamin D, bile acids, corticosteroids, sex hormones, reactions of steroids. **Alkaloids:** Introduction and classification, distribution, extraction, purification and isolation of alkaloids, synthesis of nicotine, quinine. reactions of alkaloids.

CHE 3210 – RESEARCH PROJECT

The course consists of research work at the bench with a selected supervisor, submission of a final research report and some lectures on research methodology, literature search and how to write a final research report. The supervisor can be from the internal academic staff of Rajarata University of Sri Lanka or from a recognized research institute. Students are free to choose a research topic based on their research interests with the help of a supervisor. Some research topics will be made available by the academics. In order to approve the proposed project, it should be primarily chemically-based. At the end of the semester, the student must submit a comprehensive report of the work accomplished to the head of the department with the approval of the research adviser. Grade will be awarded based on the report and the final presentation.

CHE 3311 - ADVANCED ANALYTICAL CHEMISTRY

Separation and spectroscopic methods: Colorimetric and Spectrophotometric Methods: Principles of colorimetric and spectrophotometric methods, combined Beer-Lambert law and its application in UV-Vis spectroscopy, deviations of Beer-Lambert law, matrix effects and corrections. Atomic Spectrometric Methods: Atomic absorption spectroscopy (AAS), Emission spectroscopy, flame emission spectrometry, plasma emission spectrometry (Inductive Couple Plasma), applications in quantitative analysis. Ion-exchange Methods. Solvent Extraction: Distribution coefficient, distribution ratio, factors favouring solvent extraction, quantitative treatment of solvent extraction equilibria, synergistic extraction, ion association complexes, extraction reagents, solvent extraction of metals. **Chromatographic Methods**: Principles of paper chromatography (PC), thin layer chromatography (TLC), gas-liquid chromatography (GLC), Ion chromatography (IC), high performance liquid chromatography (HPLC) and Column chromatography. Electro-Analytical Chemistry: Ion selective electrodes, electro-gravimetry and Coulometric Methods of Analysis: Current voltage relationship during electrolysis, ohmic potential drop, concentration polarization, kinetic polarization, over potential; Coulometry: Chemical analysis using polarography and its limitations; Modified polarographic techniques: Normal and differential pulse polagraphy and square wave polarography. Analytical Techniques in Biochemical Analysis: Methods of disintegration of tissues/ cells, Separation of sub-cellular organelles, Solvent and salt precipitation, Column chromatography, HPLC, fast protein liquid chromatography (FPLC), spectrofluorometry, Electrophoresis with some practical applications, Ultracentrifugation. Nuclear Analytical Techniques.

CHE 3213- INDUSTRIAL CHEMISTRY

Metallurgy and Alloys: Occurrence of metals, basic concepts of metallurgy, classification of metallurgical processes, concentration of ores, extraction of metals, hydro-metallurgy, pyro-metallurgy, refining (e.g.: extraction of Al, Cu, Mg, Zn, Fe, Ti), Thermodynamics of the oxidation of metals to metal oxides, Ellingham diagrams and their applications in metal extraction. Allotropic forms of iron, Cast Iron: Iron-Iron carbide and iron-carbon phase diagrams, transformations resulting into white cast iron, grey cast iron, malleable cast iron, S. G. iron, alloy cast iron; correlation of properties to their microstructures and applications; Alloy steels, effect of alloying elements on steel properties. **Heat Treatment of Steels:** Time-Temperature-Transformation diagram, isothermal and continuous transformations; Austenitic grain size control/grain refinement, study of effects like temper-brittleness, overheating and burning of steels study of heat-treatment processes with heat treatment cycles for plain C steels such as different types of annealing. Applications of above processes for the industrial practices; Non-ferrous alloys, Al-Cu alloys, Al-Si alloys, Mg-Al alloys, Ti and its alloys, Ni based alloys and alloys for high temperature applications. **Petroleum chemistry**: Occurrence and origin of petroleum, oil exploration, production of petroleum from tar sands, oil shale and crude oil, refining and classification of refinery products, tests for petroleum products, cracking of petroleum, octane rating and methods of upgrading, petrochemicals, products from carbon black, production of alkanes and aromatics, products from alkanes, aromatics and olefins, naphtha: polystyrene and production of range of plastics, the impact of the petroleum industry on the environment.

CHE 3215 - HETEROCYCLIC AND SYNTHETIC ORGANIC CHEMISTRY

Heterocyclic Chemistry: Classes of heterocycles and heteroaromatic compounds, systems of nomenclature, aromaticity of 5- and 6-membered heterocycles, comparisons with benzene. Properties, synthesis, and reactions of pyridine, the diazines, quinoline and isoquinoline, pyrrole, thiophene, and furan, other 5-membered heterocycles, indole, purines. Synthetic Organic Chemistry. Retrosynthetic analysis, disconnections, synthons, and transforms. **Synthesis of C-C bonds**: simple approaches (alcohols from Grignard reagents and carbonyls, acetylide anions, aromatics); acid-base properties of organic molecules, generation of carbanions by deprotonation, umpolung, carbanion alkylations; use of aldol and Claisen condensations, conjugate additions, cuprates, strategies for synthesizing 1,2-, 1,3-, 1,4-, and 1,5-dioxygenated systems; synthesis of C=C double bonds, 3-, 4-, 5-, and 6-membered carbocyclic rings, Diels-Alder reaction, synthesis of C-N bonds and C-O bonds (functional group interconversions); oxidations and reductions; use of protecting groups.

CHE 3216 - ADVANCED ANALYTICAL AND ENVIRAMENTAL CHEMISTRY - LABORATORY

Calibration of glassware, direct measuring instruments and analytical instruments. Use of spectrometers; UV-visible, atomic emission and atomic absorption spectrophotometers. Electro-analtycal instruments (voltammeters, ion selective electrodes) and chromatographic equipment (gas chromatograph and liquid chromatograph) from analysis of natural samples. Use of basic software packages for data processing and reporting of analytical results. Conditional effects on titrimetry and gravimetry, non-aqueous titrations. Techniques of environmental sample collection, sample preparation and sample storage. Study of inorganic and organic chemical properties of natural and wastewaters. Study of processes of generation, propagation and transformation of environmental pollutants in the geosphere and biosphere, Investigations on pollution mitigation methods.

CHE 3217 - ADVANCED INORGANIC CHEMISTRY - LABORATORY

Synthesis and analysis of the coordination complexes, UV-visible, FTIR spectroscopy of coordination complexes, characterization of synthesized organometalic compounds by UV-Visible, FTIR and voltammetry.

CHE 3218 - ADVANCED ORGANIC CHEMISTRY - LABORATORY

Phytochemical screening of natural products; chemical tests for the detection of natural products (carbohydrates, tannins, alkaloids, glycosides, steroids, saponins, terpenes and flavonoids), semi-micro scale multi-step synthesis of organic compounds, microwave synthesis of heterocyclic organic compounds, isolation, purification, quantification and characterization of natural products using chromatographic techniques (normal and reversed phase TLC, normal and reversed phase column chromatography, gel permeation chromatography, GC, HPLC, 1D, 2D NMR, IR, mass spectrometry etc), bioassay guided fractionation of natural products, chemical modification and synthesis of potentially active drugs.

CHE 3219 - ADVANCED PHYSICAL CHEMISTRY - LABORATORY

The experiments involved are in Thermodynamics of solution Chemistry; calculation of Gibbs Free Energy change of mixing, construction of phase diagram for a ternary system, Electrode potentials; Redox titrations, determination of thermodynamic parameters by electrode potential measurements, Voltammetric studies; cyclic voltammetry, chronoamperometry, Reaction Kinetics, Semiconductor Electrochemistry; construction of dye-sensitized solar cell, Molecular Spectroscopy, computer-assisted data acquisition and analysis, plot a function using Excel, plotting the solutions to the 1-D and 2-D Schrödinger equation.

CHE 3120 - CALCULATIONS IN CHEMISTRY

Coordinate Systems: Cartesian and polar coordinates in two and three dimensions; solids and surfaces. **Complex numbers:** Theory of complex numbers, Argand diagrams, de Moivre's theorem, Euler formula, complex conjugates. Techniques in integration: Standard integrals, boundary conditions and definite integrals; Gaussian integrals; method of change of variables, integration by parts. **Differential equations:** Introduction to differential equations; examples of differential equations in Chemistry, e.g., Newtonian and Hamiltonian mechanics, angular momentum, quantum mechanics, chemical kinetics and thermodynamics, transport phenomena, exponential growth and decay; techniques for solution, separation of variables, eigenfunctions and eigenvalues; first and second order linear differential equations; partial differential equations, differential operators in Cartesian and polar coordinates. Infinite series: Simple arithmetic and geometric series; convergence; Taylor series and their applications. **Probability:** Introduction to probability theory; probability distributions (normal (Gaussian), Poisson, binomial, and Boltzmann).

CHE 3121 - INDUSTRIAL TRAINING

Training in a research institute/ industry relevant to the chemistry special degree programme for a period of 4-6 weeks, under a professional supervision; Hands on experience in all aspects in functioning of an organization, Application of knowledge and skills in work place situations, Adherence to protocols, Quality management and standards, Management structure and legal framework of an organization.

CHE 3222 - ELECTRONICS AND IT FOR CHEMISTRY

Analogue Electronics: Law of Electricity; Ohm's, Kirchhoff's and power laws, voltage dividers, current splitters, direct current, voltage and resistance measurement, errors in voltage measurement. Alternative Current Circuits; Sinusoidal signals, inductive and capacitor reactance, series RC circuits, current change in RC circuits, phase relation, impedance in RC circuits, low pass and high pass filters based on RC circuits, basics of chemical impedance spectroscopy. Semiconductor devices; Transistor biasing and transistor as an amplifier, voltage gain, transistor as a switch, Introduction to field effect transistors, JFETs and MOSFETs. Operational amplifiers; Inverting and non-inverting amplifiers, comparators, current followers, summing amplifiers, op-amp based electronic ammeters and voltmeters, semiconductor device applications in chemical industry. **Digital Electronics:** Analog and digital signals, binary numbers, digital-to-analog converters, analog-to digital converters; Basic logic gates, introduction to logic families, logic operators and Boolean laws, designing of combinational logic circuits, map methods, construction of a half adder and full adder circuits and Interfacing methods, Chemical electronic sensors. **Information Technology in Chemistry:** Spread sheet application: High resolution chemical

drawing software QA/QC software, Symbolic mathematical software for chemical application and electronic laboratory book (Mathermatica, TM), Chemical data processing software.

4.1.3.3 PHYSICS

PHY 3301 - ATMOSPHERIC PHYSICS

Introduction: Origin and composition of the Atmosphere, The distribution of Atmospheric mass and gaseous constituents, The temperature distribution and charged particles, Atmospheric Thermodynamics: The hydrostatic equation and its applications, Heat imbalance and weather. The Thermodynamics of Water Vapor and Moist Air: Equation of state, Phase change and latent heats, The Clausius –Clapeyron equation, Adiabatic process of saturated air, Thermodynamic diagram. Hydrostatic Stability and Convection: Upper air soundings, Altimetry, The dry moist adiabatic lapse rates, the parcel method, the slice method, Entrainment and the bubble theory. Radiation in the Earth-Atmosphere: Geographical and seasonal distribution of solar radiation, radiative heating and cooling of clouds, Atmospheric absorption of solar radiation, atmospheric absorption and emission of infrared radiation. The Global Energy Balance: The Globally averaged atmospheric energy balance, the energy balance of the upper atmosphere, troposphere and earth's surface, time variations in the energy balance. Wind in the earth atmosphere: Wind-global scale circulation, Wind-synoptic scale weather, Local and regional circulation, severe weather, Thunderstorms, Tornadoes and hurricanes Precipitation. Properties and Behavior of Cloud Particles: Atmospheric aerosol, Equilibrium vapor pressure over a curved surface, condensation nuclei and the equilibrium vapor pressure over solutions, Distribution of aerosols, growth of droplets, Equilibrium vapor pressure over ice and water, Precipitation, artificial cloud modification, Cloud types, Dew, Fog. Electrical Activities of Clouds: Electric charge generation, Origin and distribution of ions, Charge separation in clouds, lightning discharge. Meteorology: Meteorological instruments and observations, Humidity and stability, Weather modification, Weather analysis and forecasting, Tropical meteorology, World climate, Climate records.

PHY 3202 - MATHEMATICAL METHODS FOR PHYSICISTS

Coordinate Systems: Cartesian, Spherical, cylindrical, Matrices and determinants: Orthogonal Matrices, Hermitian Matrices, Unitary Matrices, Diagonalization of Matrices, Normal Matrices, Eigen values and Eigen vectors. Complex Numbers: Cauchy-Riemann condition, Cauchy's integral formula for derivatives, Taylor's expansion, Laurent expansion, Singularity. Infinite Series: Convergence Tests, Alternating Series, Series of Functions, Power Series, Alternative series (Leibnitz test), Asymptotic Series. Differential Equations: Ordinary and Partial differential equations, Riemann Integral Functions. Fourier series: General properties of Fourier series, application of Fourier series, Fourier Transform convolution theorem, Laplace transforms. Special Functions: Hermitian differential operators, orthogonality and completeness of Eigen functions, Legendre polynomials, generating functions, recurrent relations, spherical harmonics.

PHY 3203 - PHYSICAL OCEANOGRAPHY

Introduction, Ocean dimensions, Shapes and bottom materials, Sea-floor dimensions, Scales, Shore, Continental shelf, Deep sea bottom and sounding. Physical properties of sea water, Salinity and conductivity, Properties of pure water, Salinity and conductivity, Temperature, Density, Effect of salinity and temperature on density, Other characteristic properties, Sound in the sea, Light in the sea, Color of sea water. Waves in the ocean, Physical distribution of water, Characteristics in the oceans, Density distribution, Temperature distribution, Salinity distribution, Water, Salt and Heat budget of the ocean, Circulation and water masses of the oceans, Indian ocean, Pacific Ocean, Equatorial circulation, Easterly boundary currants and E1-Nino, Atlantic ocean, Southern oceans, Coastal oceanography, Coastal upwelling, Estuaries.

PHY 3204 - APPLIED GEOPHYSICS

Seismic waves, Refraction of seismic waves and earth structure, Reflection of seismic waves and earth structure, Seismic surveying, Deformation of solids and seismic reflection, Data processing and interpretation, Gravity on the earth, Gravity surveying, Bouguer gravity and geology, Earth magnetism, Surveying the anomalous magnetic fields, Magnetic anomalies and their geologic sources, Application of geophysics: Geoelectric surveying, Electromagnetic surveying, Geophysics well logging.

PHY 3105 - PHYSICAL GEOLOGY

Changing earth with time, Minerals and matter, Origins and occurrence of intrusive igneous rocks, Origin and occurrence of extrusive igneous rocks, Weathering and soils, Sedimentation and sedimentary rocks, Metamorphic rocks, Absolute time and geologic time, Deformation, Earthquakes and the earth's interior, Oceans plates, Continents and drift, Movements of surface material, Underground water and running water, Energy, Useful materials.

PHY 3206 - SOIL PHYSICS

The soil in perspective: Soil forming processes, The soil profile, Major components of soil, Mineral (inorganic) and organic soil, Physical properties of soils: Soil texture (Particle size distribution), Methods of mechanical analyses, Particle -and bulk – density of mineral soil, Pore spaces of mineral soil, Soil classification systems. Soil water: Properties of water, Static pressure in water, Capillary moisture, Saturated water flow, Unsaturated water flow, Water vapor movement in soil, Hydraulic grad lent. Nature and behavior of clay: Structure of the principle clay minerals, Genesis of clays, Physical properties of clay minerals. Temperature and heat flow: Modes of energy transfer, Conduction of heat in soil, Thermal conductivity of soil, Soil stress and strain; Concepts of strain and stress, Elasticity and plasticity, Failures of soil bodies. Shear strength: Measurements of shear strength, Shear strength of clay.

PHY 3207 - ENERGY RECOURSES

Fossil Fuel and Petroleum: Origin, Mining and refining, Industries based on petroleum products. Batteries and Fuel Cells: Primary and rechargeable batteries, Electrode materials, Ionically and electronically conducting polymers, Polymer composite materials, H_2-O_2 fuel cells, Methanol fuel cells etc. Solar Energy: Solar spectrum, Energy harvesting materials (semiconductors, dyes, chlorophyll etc.) Physics of Semiconductor Solar Cells: p-n junction solar cells, Hetero junction, Interface and thin film solar cells; Dye sensitized nano

crystalline solar cells, Dye sensitized p-n solar cells, Solar radiation conversion efficiency, Photodecomposition of water, H_2 gas clean fuel. Nuclear Energy: Fission and fusion, Waste handling. Hydro power, Wind power, Tidal power**.**

PHY 3208 - PROJECT

Students will carry out individual projects under the supervision of senior academic staff members.

PHY 3209 - SOLID STATE PHYSICS

Inter-atomic bonds: Ionic, Covalent, Metallic and Van der Walls bonds, Crystal structure, Space lattices, Crystal systems, Indices of planes and directions, The common crystal lattice structures, Reciprocal lattice concept, Lattice imperfections; Lattice vibrations, Point defects, Line defects and plane defects, Amorphous materials, Structure determinations; X-ray, Neutron and electron diffraction, Electron in solids, The effective mass of electron, Band theory of solids, The Kronig-Penny model.

PHY 3210 - PROPERTIES OF MATERIALS

Conducting properties of materials, Semiconductors and Super-conductors, Mechanical properties of materials; Mechanical tests, Elastic and plastic behavior, Fracture; Brittle and Ductile fracture and fatigue failure, Creep, Optical properties; Absorbance, Color, Luminosity, Photosensitivity, Scattering.

PHY 3311 - MEDICAL PHYSICS

Introduction to Medical Physics: What is medical physics, A physicist's approach to medical physics, History of medical physics. Review of atomic and nuclear physics: Atomic structure, Band theory, EM spectrum and relativity idea, Radioactivity, Production of radioactive materials, Various attenuation coefficients, Interaction processes and their practical consequences, X-rays: X-ray tubes and generators, X-ray production and properties, Imaging with X-rays and film processing, X-ray imaging modalities (General radiography, Mammography fluoroscopy and computed tomography), Image quality influence factors, methods of optimizing quality and image system capabilities. Introduction to nuclear imaging: gamma camera, Basics of radiotherapy: Teletherapy machines, simple treatment planning, dosimetry principles and detectors. Radiobiology: Basics of radiobiology, radiation protection. Physical basis of light: Visible light, IR, UV and Laser, Interaction of light with biological systems, transillumination and endoscopy. Lasers: Principles of laser production, types of commercially available lasers and their features, biological effects caused by lasers, Laser instrumentation, Clinical applications of lasers and laser hazards. UV radiation: Production of UV radiation, Interaction with human body, Biological effects of UV radiation. Ultrasound: Basic physics behind diagnostic ultrasound/ultrasound wave, Properties of ultrasound (US), Generation and reception of US, Imaging with US and scanning methods, types of US scanners (A-mode, B-mode, M-mode) and their features, Doppler effect and Doppler ultrasound, Artifacts of US imaging, Typical applications of US in diagnostic radiology and biological effects. Electromagnetic waves and their applications: Properties of light, medical applications of visible light. Fiber optics: Theory and medical applications. Nuclear magnetic resonance: Nuclear magnetic resonance, Nuclear magnetic resonance pulse sequences, relaxation processes and their measurement, Nuclear magnetic image acquisition and reconstruction, MRI Instrumentation, MRI safety.

PHY 3212 - ELECTRONICS II

Bipolar Junction Transistors: Advanced BJT circuits, Ebbers-Moll equation, Field Effect Transistors: Junction FETs, Characteristics, comparison with BJT, Applications: Amplifier, Switch, current limiters, Voltage controlled resistors. MOSFET logic Switches: PMOS, NMOS, CMOS. Digital Electronics: decimal, binary, octal, hex and base conversion. Codes: BCD, Gray, ASCII and parity. Basic digital logic gates and truth tables. Boolean Algebra: Postulate and theorems, equation reductions and circuit implementations. DeMorgan's theorems - NAND and NOR gates and implementation. Sum of Product circuits. Karnaugh map and circuit simplification. Multiplexers, demultiplexers, decoders. 12 Basic SR Flip-Flops, D Latch, Clocked and Edge Triggered D Flip-Flops. Edge Triggered JK Flip-Flop. One Shot Multivibrators and 555 type timers. Ripple Counter. Sequential Logic - Synchronous Counters, Shift Registers and basic State Machine concepts. Memory Systems– RAM, ROM, PROM, and EPROM.

PHY 3213 – THE CURVED SPACE TIMES OF GENERAL RELATIVITY

Gravity as Geometry: Testing the Equality of Gravitational and Inertial Mass, The Equivalence Principle, Clocks in a Gravitational Field, The Global Positioning System, Spacetime is curved, Newtonian Gravity in Spacetime Terms, The Description of Curved Spacetime: Coordinates, Metric, The Summation Convention, Local Inertial Frames, Light Cones and World lines, Length, Area, Volume, and Four-Volume for Diagonal Metrics, Embedding Diagrams and Wormholes, Vectors in Curved Spacetime, Three-Dimensional Surfaces in Four-Dimensional Spacetimes, Geodesics: The Geodesic Equation, Solving the Geodesic Equation-Symmetrics and Conservation laws, Null Geodesics, Local Inertial Frames and Freely Falling Frames, The Geometry Outside a Spherical Star: Schwarzchild Geometry, The Gravitational Redshift, Particle orbits-precession of the Perihelion, Light Ray Orbits, The Deflection and Time Delay of Light, Solar System Tests of General Relativity: Gravitational Redshift, PPN Parameters, Measurements of PPN Parameter γ, Measurement of the PPN Parameter β, Precession of Mercury's Perihelion, Relativistic Gravity in Action: Gravitational lensing, Accretion Disks Around Compact Objects, Binary Pulsars, Gravitational Collapse and Black Holes: The Schwartzchild Black Hole, Collapse to a Black Hole, Kruskal Szekeres Coordinates, Non-Spherical Gravitational Collapse, Astrophysical Black Holes: Black Holes in X Ray Binaries, Black Holes in Galaxy Centers, Quantum Evaporation of Black Holes-Hawking Radiation, A Little Rotation: Rotational Dragging of Inertial Frames, Gyroscopes in Curved Spacetime, Geodetic Precession, Spacetime Outside a Slowly Rotating Spherical Body, Gyroscopes in the Spacetime of a Slowly Rotating body, Gyros and Freely falling Frames. Rotating Black Holes: Cosmic Censorship, The Kerr Geometry, The Horizon of a Rotating Black Hole, Orbits in the Equatorial Plane, The Ergosphere, Gravitational Waves: Linearized Gravitational waves, Detecting Gravitational Waves, Gravitational Wave polarization, Gravitational Wave Interferometers, The Energy in Gravitational Waves. The Universe Observed: The Composition of the Universe, The Expanding Universe, Mapping the Universe. Cosmological Models: Homogeneous, Isotropic Spacetimes, The Cosmological Redshift, Matter, Radiation and Vacuum, Evolution of the Falt FRW Models, The Big Band and Age and Size of the Universe, Spatially curved Robertson-Walker Metrics, Dynamics of the Universe, Which Universe and Why? Surveying the Universe, Explaining the Universe.

PHY 3214 - GRAPHICAL PROGRAMMING FOR PHYSICS

Introduction to graphical programming (LabVIEW), Introduction to Virtual Instruments: Front Panel, Block Diagram, Icon and Connector pane, Graphical Programming tools, Notation and names: Notation and Naming Conventions: Scalars, Constants, and Arrays, Array Operation Notations, LabVIEW Environment. Building the Front Panel: Controls and Indicators, Building the Block Diagram, Running and debugging VIs, Creating VIs and sub VIs, Loops and Case Structures, Event-Driven programming, Grouping data using Strings, Arrays and Clusters, Local and Global Variables, Graphics and Charts, Graphics and Sound, Instrument drivers.

PHY 3215 - PRACTICAL UNIT

Electrical & electronics measurements and measuring instruments, diode characteristics, diode applications, filter circuits, transistor characteristics, transistor applications, microcontroller programming, diffraction, scattering, characteristics of solar cells, material characterization.

4.1.3.4 BIOLOGY

BIO 3201 - MOLECULAR BIOLOGY

Introduction to the hereditary material of life, DNA Replication in prokaryotes and eukaryotes, DNA repair, Transcription in prokaryotes and eukaryotes, RNA splicing, Prokaryotic translation, Eukaryotic translation, Principles of protein structure, Posttranslational modifications, Regulation of gene expression in prokaryotes and eukaryotes, DNA isolation and quantification, PCR techniques and its applications and gel electrophoresis.

BIO 3102 - ECOTOURISM

Introduction to fundamental concepts in tourism, Introduction to Ecotourism, Ecotourists, Ecotourism Environments, The Ecotourism Business, Socio-economics of Ecotourism, Ecotourism Development Planning, Community based sustainable tourism

BIO 3203 - ENVIRONMENTAL POLLUTION

Environmental Pollution Introduction, Air Pollution from different sources, photochemical smog; Environmental effects due to air pollution Noise Pollution; Water Pollution, Agricultural Pollution, Solid waste and its management, Hazardous Waste Pollution, Energy and the Environment, Mitigatory Measures for environmental pollution, Economic and Legal questions and Environmental Action

BIO 3204 - BIOINFORMATICS

Introduction to bioinformatics, Molecular databases, Bioinformatics and computational biology software and freeware, Sequence alignment, Phylogenetic analysis, Functional genomics, DNA microarrays, Protein structure analysis and modeling, Motif identification, Evolutionary alignments and structure prediction.

BIO 3205 ECOTOXICOLOGY

Introduction, history and terminology. Sources and different categories of toxins & toxicants. Exposure routes, uptake, and Elimination of toxicants. Transport and environmental fate of toxicants with particular emphasis on Bioavailability, Bioaccessibility, Bioaccumulation, Bioconcentration, Biomagnification, and Biotransformation, Mammalian toxicity tests and Standard Ecotoxicity testing methods. Factors affecting the toxicity, Hazard & Risk assessments, Environmental toxicology of engineered nano materials. Evaluation of acute and chronic toxicity, bioassays and biomarkers; Radiation and health risks.

BIO 3206 – EXPERIMENTAL DESIGN AND NON PARAMETRIC METHODS IN STATISTICS

Introduction to experimental design, Experimental study, Observational study, Experimental design phase, Statistical analysis phase, Terms and concepts in designs of experiment, Basic concepts, Comparing two means, Randomized block designs (Paired Designs), Two Factor Experiments, Multivariate Data Analysis Techniques.

BIO 3207- FIELD PROJECT

A research project, totaling to 2 Credits is assigned to each student under the supervision of a senior academic staff member. The projects can be carried out in the areas of Ecology, Biodiversity, Wildlife conservation, Fisheries Management, Aquaculture, Biotechnology, Molecular biology and Microbiology. Before commencement of the research work, a proposal should be submitted including plan, the methodology of the project and expected outcome and presented at a seminar before a panel of examiners. Progress of the project should be presented in the 10th week of the semester and a report should be submitted to the supervisor. A dissertation should be submitted before the end of the academic year on or before an agreed date by following the given thesis guidelines. Finally the findings of the project should be presented before a panel of examiners.

4.1.3.5 BOTANY

BOT 3201 – PLANT TISSUE CULTURE

Introduction and history of plant tissue culture; Techniques, equipment and media; ***In-vitro*** **methods in plant tissue culture** such as micro propagation, callus, suspension culture, meristem and organ culture, regeneration and morphogenesis, **Role of PGRs in plant tissue culture,** Cryopreservation**, Crop improvement techniques**: haploid cultures, somaclonal variation, protoplast isolation, culture and fusion, embryo rescue cultures, Genetic transformation and production of transgenic plants. *In-vitro* production of secondary metabolites, Plant Cell Bioreactors, Current status of the application of tissue culture in Sri Lanka, Entrepreneurship in the 21st century, intellectual property protection for plants.

BOT 3202 – PRINCIPLES AND PRACTICE OF HORTICULTURE AND LANDSCAPING

Importance and limitations of horticulture, Methods in propagating horticultural plants, Techniques in improving horticultural plants, Use of plant growth regulators and related chemicals in horticulture, Manipulating tree architecture (physical control), Methods of controlling external environment, Methods employed, advantages and limitations of hydroponics, Postharvest (PH)handling of horticultural products, Introduction to legislation related to horticulture, Feasibility and future prospects of horticulture and floriculture as an industry in Sri Lanka, Focal points in landscaping, Styles of gardening, Types of gardening, Indoor gardening, Rooftop gardening, Landscaping sites of public importance, Horticulture and landscaping as a business venture

BOT 3203 – POST HARVEST TECHNOLOGY OF PLANT PRODUCTS

Postharvest physiology of plant products, biological and environmental factors involved in deterioration, postharvest losses, postharvest diseases, pre-harvest management, harvesting and field handling, harvesting maturity, packing house operations, cooling, storage, transport, marketing, handling systems of minor commodities, minimal processing and modified atmosphere packaging, emerging technologies of postharvest disease management

BOT 3204 - FLORA OF SRI LANKA

Introduction and significance of studying floristic diversity of Sri Lanka, Climatic conditions and vegetation classification of Sri Lanka, Floristic regions of the Island, Salient plant-animal interactions in the natural forests of Sri Lanka, Natural and man-made vegetation types and forest and non-forest vegetation of the island, Structure and floristic composition of main vegetation types, Special floral groups, Threats on the flora of Sri Lanka, conservation and management issues of forest products and resources.

4.1.3.6 BIODIVERSITY

BDC 3301 - CONCEPTS OF BIODIVERSITY CONSERVATION

Biodiversity and conservation: Introduction and overview of biodiversity, genetic diversity, its measure and its modifications, biogeography, zoogeography and phytogeography, species loss and extinction, theory of Island biogeography on species extinction, species inventory & its measures, global habitat classification, uses and values of biodiversity, environmental and economic valuation methods of biodiversity, threats and loss of biodiversity, invasive species and threatened species, conservation and Management of biodiversity: conservation education, ex-situ and in-situ conservation, ex-situ centers for fauna & flora conservation, conservation of rare and endanger animals, captive breeding and success story on reintroduction.

BDC 3202 - ENVIRONMENTAL IMPACT AND RISK ASSESSMENT

An introduction to EIA, Legal and Institutional background, EIA process, methodologies for assessing Impacts, Quantification of environmental impacts techniques of valuing environmental impacts; Assessment of environmental impacts, Public participation in environmental performance reviews and the managerial response. Risk and uncertainty in EIA: The nature of uncertainty, Risk Assessment; Hazards identification, & accounting, Risk characterization & management, Human Risk Assessment, Comparative risk assessment, Ecological Risk Assessment and Risk to economic welfare.

BDC 3203 - INTRODUCTION TO GEOGRAPHIC INFORMATION SYSTEMS

Scope and Application Areas, Purpose and Benefits of GIS. Functional Elements of GIS, Mapping Concept, coordinate system, datum, and projection systems, Geometric Rectification. Raster Data Structure, Vector Data Structure, Data Compression Techniques. Analogue to digital conversion, Accuracy of digitization. Data from Remote Sensing Imagery, GPS based data acquisition. Data Manipulation Techniques, Spatial Analysis Techniques - statistical and geometrical, Geoprocessing Techniques, Model Development, Data Quality, Accuracy Assessment using Statistical Tests. Layout of Maps, Intelligent Maps, Charting and Tabular representation of the results using GIS

BDC 3204 WILDLIFE CONSERVATION AND MANAGEMENT

Goals and management decisions, Food and nutritional ecology, Behaviour and the dynamics of populations and communities, Population growth, Dispersal, dispersion and distribution, Population regulation, Fluctuation and competition between species, Facilitation between species, Predation, Parasites and pathogens, Consumer resource dynamics, Population census techniques, Model evaluation and adaptive management, Experimental management, Conservation theory, Conservation in practice, Wildlife harvesting, Wildlife control, Ecosystem management and conservation.

4.1.3.7 FISHERIES AND AQUACULTURE

FAM 3201 - FISHERIES AND AQUACULTURE

Fisheries - World fisheries; Regulation of International and national fisheries; Fisheries legislation, prohibited and restricted fish species for exportation; Fishing gear and crafts; Marine fisheries - costal, inshore and offshore fisheries, pelagic and demersal fisheries; Potential of Brackish water fisheries; Inland fisheries – riverine fisheries, reservoir fisheries; Basic principles of fisheries management. **Aquaculture:** History of world aquaculture and status of aquaculture in Sri Lanka; Site selection criteria for aquaculture; Production methods and systems; Water quality management; Culture of Fin fish and Shell fish; Fish nutrition and health management; Basic principles in preservation and processing of fish and fishery products.

FAM 3202 - BREEDING TECHNIQUES IN AQUACULTURE

Natural spawning of fish; Brood stock selection and management; Controlled spawning of finfish, crustaceans and mollusks; Natural spawning; Conditioning; Induction of breeding – semi artificial & artificial; Collection and incubation of eggs.

FAM 3303 - ORNAMENTAL FISH INDUSTRY

Status of world ornamental fisheries; Constraints and problems in ornamental fisheries sector; Identification of important ornamental fish varieties – freshwater and marine; Breeding of ornamental fish; Selection and management of brood stock; Stock improvement; Use of biotechnology in stock improvement; Producing hybrids; Breeding methods of different species; Nursery management; Mud pond preparation; Stocking and harvesting; Pond Management; Important water quality parameters; establishment and maintenance of aquaria, setting up of an aquarium (including construction of tanks, filter systems etc.) Harvesting, packing and transportation; Legislation including quarantine, wild catch, export etc.

4.1.3.8 MICROBIOLOGY

MIB 3201 - INDUSTRIAL MICROBIOLOGY

Microbial growth processes and kinetics, fermentation technology- bioreactor/ fermentor design, solid surface fermentation, microbial product development, regulation and safety, enzymes biotechnology, biotransformation, Introduction to industrial processes, biofertilizers, bioherbicides and biopesticides production, biofuels and industrial chemicals - ethanol, amino acids, microbial polysaccharides, single cell oils, antibiotics, vaccines, vitamins, production of steroid hormones, vinegar production, biomass production, environmental applications, microbial analysis of water, water treatment processes, waste water treatment, solid waste compost production, soil remediation processes, heavy metal bioabsorption, biomining, biosurfactants, biopolymers and bioplastics production, biosensors and applications.

MIB 3202 - SOIL MICROBIOLOGY

Introduction, soil microbial community, soil as a special habitat, soil microbial diversity and interactions, soil microbial communities (colonization, succession, microbiostasis), survival strategies of microorganisms, quantitative microbial ecology, substrate for colonization, disease suppressive and permissive soils, overview of rhizosphere as a special soil environment, soil microorganisms and plant health and productivity, microbial inoculations of soil, modern methods of assessment of microbiota in soil

MIB 3203 - VIROLOGY

History of virology, Structural components of viruses and their functions, Importance of viruses, Virus classification, Infection cycle emphasizing different mechanisms in replication of viral genome, other subcellular infectious agents, Sequential gene expression in phages, Molecular mechanism of lytic, lysogenic decision, Plant viruses, Retro viruses, Immerging viral diseases.

MIB 3204 - FOOD MICROBIOLOGY

Introduction to food microbiology, dairy microbiology, milk testing, natural antimicrobials in milk, probiotics, prebiotics, intrinsic and extrinsic factors affecting microbial growth, microbe-food interactions, Production of fermented foods and food additives, single cell proteins, mushroom production technology, microbial food spoilage, foodborne pathogens, foodborne diseases, virus and prions foodborne diseases, conventional and rapid methods for the microbiological examination of foods, food preservation methods, food packaging, use of biopreservatives, functional foods and GM foods, food safety, Hazard Analysis Critical Control point (HACCP) plans.

MIB 3205 - PLANT –MICROBE INTERACTIONS

Rhizosphere microflora, plant growth promoting rhizobacteria (PGPR), mutualistic symbiosis, Physiological and biochemical processes in nitrogen fixation, Nodulation, genetic and molecular fundamentals of biological nitrogen fixation, Physiology and molecular biology of non-symbiotic nitrogen fixation, Fungal symbiosis- mycorrhizae, biology of mycorrhizal symbiosis in natural and agro-ecosystems, Ecology and genetics of the arbuscular mycorrhizal symbioses, Taxonomy and detection methods of mycorrhizal fungi, Methods and applications of mycorrhization, Case studies using recent publications

MIB 3206 - ANALYTICAL TECHNIQUES IN MOLECULAR BIOLOGY

Extraction, fractionation, purification and characterization of organelles and biomolecules: Extraction techniques, Centrifugation, fractional precipitation using salt and organic solvents, dialysis, column chromatography and Electrophoresis, spectroscopy: Absorbance, transmission, fluorimetry; Chromatography in analysis and preparation of micromolecules; Thin Layer and Paper chromatography, High Performance Liquid Chromatography , Medium Pressure Liquid Chromatography, Gas Chromatography with Mass Spectroscopy, Qualitative and quantitative methods of analyzing separated compounds.

MIB 3207 - IMMUNOLOGY

Introduction to immunology; concepts, terminology and overview, Cells in immunity, Innate and adaptive immunity, Maturation, activation and regulation of lymphocytes Antibodies; types, structure and function, Ig diversity, T cell receptors, Complement system, MHC molecules, Autoimmune diseases, Cytokines and Immune Function, Immunity in defense against transplantation and tumors, Techniques in immunology.

MIB 3208 - ENVIRONMENTAL MICROBIOLOGY

Bioremediation: substrate, organisms, environment, acclimation, Carbon utilization and technologies available, Microbes in biogeochemical cycling in terrestrial and aquatic environments and the influence on human, Biofilms, Microbial communities in extreme environments, energy from wastes, Solid wastes management in urban communities, Student seminars on current environmental issues, Practical assignments: sampling, isolation Strategies

4.1.3.9 COMPUTER SCIENCE

COM 3401- DATA COMMUNICATION AND NETWORKING

Data Communications: Data Transmissions, Digital Coding, Analog Signals, Modulation and Demodulation, Digital-to-Analog Conversion, Data Encoding. Communication Media: Twisted Pair Wires, Coaxial Cables and Optical Fiber. Transmission Impairments: Forward and Backward Error Control, Error Detection and Correction. Computer Networks: Why Computer Networks? Bus, Star, Ring, Hybrid, Tree, Complete and Irregular Network Topologies, LAN, MAN and WAN. Layered Network Architecture: Layers, Protocols, Interfaces, Design Issues for Layers, OSI and TCP/IP reference models. Application, Presentation, Session, Transport, Network, Data-Link and Physical Layers. Protocols: TCP, UPD and IP Protocols, IP Addresses, IP Packet Format, Direct and Indirect Delivery, Routing, Classless and Subnet Addresses, CIDR, Transparent Routers, Proxy ARP, ARP, RARP, ICMP. Applications: Email (SMTP, POP), HTTP, FTP, TELNET and DNS. Physical Layer Interfaces: RS-232 and X.21.

COM 3303- ARTIFICIAL INTELLIGENCE

Artificial Intelligence: Introduction, Intelligent Agents; Problem Solving: Solving Problems by Searching, Beyond Classical Search, Adversarial Search, Genetic Algorithms, Constraint Satisfaction Problems; Knowledge and Reasoning: Logical Agents, First-Order Logic, Inference in First-Order Logic, Prolog, Classical Planning, Planning and Acting in the Real World, Knowledge Representation; Uncertain Knowledge and Reasoning: Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions, Fuzzy Logic; Learning: Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning , Artificial Neural Networks; Communicating, Perceiving, and Acting; Natural Language Processing: Natural Language for Communication, Perception, Robotics.

COM 3204 - INFORMATION SECURITY

Security Problem in Computing: Attacks, The meaning of computer security, Computer criminals, Methods of defense. Elementary Cryptography: Terminology and background, Mathematics for Cryptography, Symmetric encryption, Public key encryption systems, Substitution Ciphers, Transpositions, Making "Good" encryption algorithms, The data encryption standards (DES), The AES encryption algorithm, Public key algorithm, The Uses of encryption. Programme Security: Secure programmes, Nonmalicious programme errors, Viruses and other malicious code, Targeted malicious code, Controls against programme threats. Protection in General – Purpose Operating System: Protected objects and methods of protection, Memory and address protection, File protection mechanism,

User authentication. Security in Networks: Threats in networks, Network security controls, Firewalls, Intrusion detection systems, Secure E-mail. Administering Security: Security planning, Organizational security policies, Physical security.

COM 3405 - GROUP PROJECT

Students must select an application domain and submit a project proposal to the faculty. Academic staff members may also propose project topics based on current requirements and interests of the faculty. Students are expected to apply the knowledge they have gained throughout the first three years of study and come out with an innovative and useful solution.

Project identification and proposal preparation, Analysis and specification, domain specific and technology specific research and literature review, concept development, software development life-cycle selection, system design and specification, selection of technologies and CASE tools for implementation, use of software engineering best practices, system implementation and testing, system deployment, report writing, research paper writing and publication, project demonstration, project marketing.

COM 3306 - OPERATING SYSTEMS

Operating System Principles: Process Management, Memory Management, Input/ Output Management, File System Design Concepts and Features: Single–Tasking OS, Batch Processing OS, Multi–Tasking OS, Real–Time OS Advanced Functions of Operating Systems: System Calls, Ready/ Block State Transitions, Advanced Features of IPC, Implementation of Semaphores, Remote Procedure Call, Deadlock Recovery, Fault Handling in Memory, Cache Management, Interrupt Handling, Stable Storage Synchronization and Communication: Mutual Exclusion in Distributed Systems, Clock Synchronization in Distributed Machines, File systems design, Protection and security, Fault tolerance, OS structure and extension techniques

COM 3307 - EMBEDDED SYSTEMS

Introduction: Embedded systems overview, Design challenge – optimizing design metrics, Embedded system technologies: Processor technologies, IC technologies, Design Technologies; General Purpose Processors and special purpose processors; Embedded system programming: MIPS/SPIM Assembly Programming, Embedded Programming in C, Designing embedded systems: Designing Custom Single Purpose Processors, Using Standard Single Purpose Processors, Embedded system development life Cycle, Peripheral interfacing: Industry Standard Buses: RS232, I2C, SPI,CAN, Microcontroller architecture: RISC, CISC, Intel 8052, PIC, ARM, IO, Memory, Microcontroller applications: Introduction to Microcontrollers & PIC Microcontroller based interfacing.

4.1.3.10 FINANCIAL/ INDUSTRIAL MATHEMATICS

MAT 3301 – ADVANCED LINEAR PROGRAMMING

Introduction. Geometric and algebraic insights of simplex method, Starting solution and convergence. Special Simplex Implementation: LU factorization & upper bound technique, Relations with nonlinear feasible and optimality conditions, Primal-dual relationships, Dual simplex and primal-dual simplex methods, Sensitivity analysis and parametric analysis, Dantzig-Wolf decomposition principle, Bender's decomposition and Lagrangian relaxation methods, Karmarker's and affine projective scaling methods. Transportations Problem, Assignment Problem, Goal Programming, Interior Point Algorithms, Dartzig-wolfe decomposition principle,

MAT 3302 – NETWORK OPTIMIZATION

Introduction. Paths, Trees, and Cycles. Shortest Paths: Label-setting algorithms, Label-correcting algorithms. Maximum Flows: Basic ideas, Minimum cost flows: Basic algorithms, Network simplex algorithms, Minimum spanning trees, Generalized flows, Multi commodity flows. The out-of-Kilter Algorithm: The out-of -Kilter formulation of a minimal cost network flow problem, Strategy of the out-of-Kilter algorithm, A labeling procedure for the out-of-Kilter algorithm. Lagrangian Relaxation and Network Optimization: Introduction, Problem relaxation and Branch and bound, Lagrangian relaxation technique, Lagrangian relaxation and linear programming, Applications of Lagrangian relaxation.

MAT 3203 – REGRESSION ANALYSIS

Simple linear regression and the principle of least squares, Matrix approach to linear regression, Multiple linear regression, Interpretation of coefficients, Inferences in regression analysis, Prediction of future values, Correlation and the coefficient of

determination, Analysis of appropriateness of the model, Model selection procedures. Regression with transformed variables, Polynomial regression.

MAT 3204 – INDEX NUMBERS

Use of index numbers. Price, Quantity and value relatives, Link and chain relatives, Problems involved in the construction of index numbers, Cost of living index numbers, Tests for index numbers, Sources of error in an index number, Limitations of index numbers.

MAT 3205 – INTRODUCTION TO STATISTICAL DECISION THEORY

Payoff tables and opportunity loss tables, Criteria for making decisions, The decision making process, The maximax criterion. The maximmin criterion, The minimax criterion, The strategy of insufficient reason, Utility theory, Decision tree analysis. Revising probabilities and posterior analysis, Inventory problems.

MAT 3206 – DATA ANALYSIS USING A COMPUTER SOFT WARE

Introduction to a statistical software. **MINITAB:** Editing, Manipulating and plotting data. **Basic Statistics:** Describe, Z-interval, Z-Test, T-interval, T-test, Two sample, Correlation, Center. **Regression Analysis:** Regress, Stepwise, β-regression, No-constant, Constant, Brief, R-line. **Time Series:** ACF, PACF, CCF, Difference, LAG, TS-plot, MS-plot. **Exploratory Data Analysis:** STEM-AND-LEAF, Boxplot, R-smooth. **Distributions and Random Data:** Random, PDF, CDF, INVCDF, Sample, Base, Presentation of results.

MAT 3307 – PROJECT

Students will carry out individual projects under the supervision of senior academic staff members**.**

MAT 3208 – TIME SERIES

Introduction. Objective of time series analysis, Some simple time series models, Stationary models and the autocorrelation function, Estimation and elimination of trend and seasonal components, Testing the estimated noise sequence. Stationary processes: Basic properties and forecasting methods, An introduction to ARMA models.

MAT 3209 – STATISTICAL COMPUTING USING SOFTWARE

Introduction to Statistical Software; SAS, Structure of a SAS programme, Applications using SAS procedures PRINT, SORT, UNIVARITE, FREQ, MEANS, CHART, CORR, PLOT, ANOVA, REG, GLM, TTEST.

MAT 3310 – INTEGER PROGRAMMING

Introduction. Modeling and applications, Use of LINDO/LINGO software for integer programmes, Dual cutting plane algorithms, Primal cutting plane algorithms, Branch and bound method, Implicit search enumeration.

MAT 3312 – STATISTICAL QUALITY CONTROL

Statistical Methods useful in Quality Improvement: Modelling process quality, Inferences about process quality. Statistical Process Control: Methods and philosophy of statistical process control, Control charts for attributes, Control charts for variables, Cumulative-sum and exponentially weighted moving average control charts, Other statistical process-control techniques, Process capability analysis, Economics design of control charts. Process Improvement with Designed Experiments: The fundamentals of experimental design, Factorial experiments and other methods for process improvement. Acceptance Sampling: Lot-by-lot acceptance sampling for attributes, Acceptance sampling by variables, Other acceptance- sampling procedures.

MAT 3213 – GRAPH THEORY

Introduction, Graphs: Varieties of graphs, Walks and connectedness, Degrees, The problem of Ramsey, External graphs, Intersection graphs, Operations on graphs. Blocks: Cutpoints, bridges and blocks, Block graphs and cutpoint graphs. Trees: Characterization of trees, Centres and centroids, Block-cutpoint trees, Independent cycles and cocycles, Matroids, Connectivity: Connectivity and line-connectivity, Graphical variations of Menger's theorem. Partitions, Traversability: Eulerian graphs, Hamiltonian graphs. Line Graphs: Some properties of line graphs, Characterization of line graphs, Special line graphs, Line graphs and traversability, Total graphs.

MAT 3214 – APPLIED STATISTICS

Samples and surveys, Selection of samples, Random samples, Use of random numbers, Biasness and unbiasness in sampling, Uses of the Exponential distribution & Normal distribution, Fitting the exponential & normal distribution to data, Methods for checking the normality assumption, Large sample tests, Two sample t-tests, Paired and Non-paired situations, Hypothesis tests using the □2 distribution, Testing the fit of data to a continuous distribution, Poisson Process, The normal approximation to the poisson distribution, The index of dispersion, Tests of goodness-of-fit to a poisson distribution, Solving problems using a computer software.

MAT 3217 – NON-LINEAR PROGRAMMING

Introduction, Lagrange Multiplier Method, Quadratic Programming, Geometric Programming, Single variable unconstrained Programming Algorithms, Multiple variable unconstrained Programming Algorithms, Constrained Programming Algorithms

MAT 3318 – PRINCIPLES AND PRACTICES OF MARKETING

The Foundation of marketing, Environmental Forces and Marketing Ethics, Strategic Marketing Planning and Forecasting, Consumer Buying Behaviour, Organizational Buying Behaviour, Market Segmentation, Product Concepts, Developing and Managing Products, Price Determination, Setting and Managing Prices, Marketing Channels – Whole-sale and Retail, Physical Distribution, Promotional Strategies and Processes, Advertising, Sales promotion and Public Relations, Personal Selling and Sales Management, Marketing Organization, Implementation and Control , International Marketing, Service and Non-profit Marketing, Quality and Customer Service, Marketing Research and Marketing Information systems.

4.1.3.11 HEALTH PROMOTION

HPT 3301 - FAMILY AND COMMUNITY HEALTH PROMOTION

Healthy families. Measures of improvements in functioning. Community processes and community health. Analysis of how community functions as a system. Improving community processes for health promotion. Community interventions to improve shared understanding of determinants of wellbeing. Community development as health promotion.

HPT 3202 - COMMERCIAL INFLUENCES ON HEALTH

Strategies used in promoting commercial interests. Advertising and marketing. Influences of commercial interests – intended and unintended. Recognizing the less visible influences. Dealing with or handling the beneficial and detrimental influence of commercial influences.

HPT 3203 - SOCIAL STRUCTURES AND SOCIAL INFLUENCE

General introduction to sociology, its perspectives, concepts and theories. Factors governing social influence. Power structures. Family and social dynamics. Groups and how they function. 'Systems' approaches to understanding and change. Approaches to improving dysfunctional groups or families.

HPT 3104 - PHILOSOPHICAL AND ETHICAL ISSUES IN HEALTH EDUCATION AND PROMOTION

Examination of problems in personal and occupational health education and health promotion through philosophical analysis. Discussion and application of key philosophical and ethical principles. Bases of 'ethical' decisions. Philosophies of health promotion.

HPT 3205 - HEALTHY PUBLIC POLICY & LEGISLATION

Health as a commodity. Health as a right. Economics of health care. Legislation in relation to health. National and International health policy development. Control by public of policymaking processes. National and international influences. Monitoring the implementation of policies. Health sector's role in promoting health. Influence of commercial entities on governments. 'Covert' operations.

HPT 3306 - REPORT WRITING AND ASSESSING

Purpose or purposes of a report. Standard structures. Differing formats for differing audiences or recipients. Criteria for assessing reports. Peer evaluation of reports and staff evaluations. Assessment of field activity and impact achieved in the assigned field area. Responses to assessments.

HPT 3107 - FUTURE DIRECTIONS

Continued contact with, and concern for, the communities or other groups linked with during field practical placement. Long term verses short term gains. Attrition or maintenance of gains. Relative persistence of processes versus products. Assuring sustainability.

HPT 3108 - LEADERSHIP

Definitions. Types. Relative advantages and disadvantages of different styles. Assessing leadership performance. Improving leadership.

HPT 3309 - THE SRI LANKAN SETTING

Current influences on perceptions of others. Socio-economic implications on families living in disadvantaged communities. Stigmatization. Deliberate self-harm. Tobacco, alcohol use and other drug use. Deprivation of rights. Violence. Child abuse. Other healing systems. Existing health resources.

FIELDWORK OF THE THIRD YEAR PROGRAMME

HPF 3101 - REPORTING HEALTH CHANGES IN STUDENT GROUPS

Reporting the process, activities and changes assessed. Reporting according to standard formats. Sustaining gains and continued follow up with the applying group/s. Communication of findings.

HPF 3302 - ADDRESSING OBSTACLES TO PROGRESS WITH COMMUNITIES

Designing activities to address identified obstacles. Implementing designed activities. Community participation to address obstacles. Assessing the changes in obstacles.

HPF 3103 - REVIEWING PROGRESS WITH COMMUNITIES AND REDIRECTING EFFORTS

Reviewing progress of the community. Identification of incorrect directions. Designing activities to redirect the process to convert ineffective activities.

HPF 3204 - EVALUATION OF PROGRESS

Comparison of baseline level and the ongoing process. Application of process, output and outcome indicators to evaluate.

HPF 3205 - FINAL EVALUATION OF FIELD SETTINGS

Selecting an appropriate evaluation design. Internal and external evaluation. Implementation of evaluation. Assess the effectiveness.

HPF 3206 - REPORT WRITING

Reporting the process, activities and changes assessed. Reporting according to standard formats. Communication and dissemination of findings of the health promotion approach.

HPF 3207 - FOLLOW UP AND CONTINUING CONTACT WITH COMMUNITIES

Planning methods to keep the contacts. Continued follow up through various approaches. Identifying mechanisms to sustain the gains.

4.1.3.12 ZOOLOGY

ZOO 3201- MEDICAL ENTOMOLOGY

Introduction to medical entomology, history of medical entomology, role of the medical entomologist, arthropods as medical importance, general characteristics of medically important arthropod orders (Orders – Scorpiones, Araneae, Acari, Thysanura, Blattodea, Hemiptera, Pthiraptera, Hymenoptera, Siphonaptera and Diptera), factors involved in vector-borne diseases, general disease cycle, methods of transmission, mechanisms by which arthropod vectors transmit parasites, characteristics of the arthropod element in the transmission cycle, biology, ecology and behavior of mosquitoes, biology, ecology and behavior of vectors other than mosquitoes (sand flies, tsetse flies, house flies, black flies, house flies, biting midges, fleas, lice, bed bugs, triatomine bugs, cockroaches, ticks and mites), major vector borne diseases in Sri Lanka and the globe, vector control, prevention and control of arthropod borne diseases, vector surveillance, emergence and resurgence of vector-borne diseases, environmental changes and vector borne diseases.

ZOO 3202 – APPLIED PARASITOLOGY

Introduction to parasitology, types of parasites, host parasite interactions, Introduction to the general biology of the parasitic protozoans, helminths, nematodes, mollusks, arthropods of humans and domestic animals. Study on morphology, taxonomy and function. Life cycles and pathogenesis of representative taxa of major groups of parasites, Importance of control of parasites, Methods of control of parasites, Field visits to Medical Research Institute to obtain field and laboratory experience of ecology and biology of parasites, Survey of parasites of domestic animals.

ZOO 3203 – ECONOMIC ENTEMOLOGY

Economically important insect and arachnid orders, definition of insect pest, population dynamics of insects, symptoms of damage caused by insect pests, economic decision levels for pest populations, insect pest outbreaks, pest management theory, evolution of pest control practices, cultural, mechanical, physical, biological, chemical, behavioural, legislative and genetically management of insect pests, hostplant resistance to insects, integrated pest management, Novel methods of insect control; use of pheromones, Sterile insect techniques, juvenile hormone and genetic engineering, Insecticide formulations and their application, classes, mode of action, toxicity, LD50 value, and environmental impact; WHO classification of insecticides, Pesticide registration and legal requirements in Sri Lanka, biology and ecology of important insect and mite pests of rice, coconut, tea, sugarcane, selected fruit and vegetable crops and stored products, Insects of commercial value: apiculture (species of honeybees in Sri Lanka, Sri Lankan honey bee colony, division of labour in a honey bee colony, behavior of honeybees, management of a honey bee colony

ZOO 3204 – EMBROYOLOGY AND DEVELOPMENTAL BIOLOGY

Mechanisms of Developmental Organization, Mechanisms of Developmental Patterning, Differential Gene Expression and Cell Differentiation, Cell-to-Cell Communication and Morphogenesis, Stem Cells, Gametogenesis, Fertilization, Early Development: Cleavage, Gastrulation and Axis Formation in Different Taxa (Protostome and Deuterostome Invertebrates, fishes, amphibians, reptiles, birds and mammals), Neural Tube Formation and Nervous System Patterning, Mesoderm and Its Derivatives, Endoderm Formation, Post Embryonic Development, Development in Health and Disease, Evolution and Development.

4.1.3.13 INFORMATION & COMMUNICATION TECHNOLOGY

ICT 3301 – HUMAN COMPUTER INTERACTION

Foundations of human-computer interaction: The human (input, output, storage and memory, information processing, emotion influences for human capabilities), The computer, Interactions, Paradigms. Human-centered software development: Input design concepts and guidelines, Input implementation methods, form design guidelines, GUI controls, tools for prototyping input design; Graphical user-interface design; Human-centered software evaluation; HCI aspects of collaboration and communication

ICT 3303 – INFORMATION SYSTEMS SECURITY

Principles and practices of cryptography and network security: public key cryptography, digital signatures, confidentiality, authenticity, web security, email security, firewalls, e-commerce, The principles and practices of cryptographic techniques: Generic security threats and vulnerabilities, The design of security protocols, Security controls: Access control, Physical and Environmental Protection, Encryption/Decryption, Malicious Code Prevention, Personnel Security and Data Security, Security monitoring: Activity Monitoring and Condition Monitoring, Analysis and Response.

ICT 3304 – EMBEDDED SYSTEMS

Introduction: Embedded systems overview, Design challenge – optimizing design metrics, Embedded system technologies: Processor technologies, IC technologies, Design Technologies; General Purpose Processors and special purpose processors; Embedded system programming: MIPS/SPIM Assembly Programming, Embedded Programming in C, Designing embedded systems: Designing Custom Single Purpose Processors, Using Standard Single Purpose Processors, Embedded system development life Cycle, Peripheral interfacing: Industry Standard Buses: RS232, I2C, SPI,CAN, Microcontroller architecture: RISC, CISC, Intel 8052, PIC, ARM, IO, Memory, Microcontroller applications: Introduction to Microcontrollers & PIC Microcontroller based interfacing.

ICT 3205 - INFORMATION TECHNOLOGY PROJECT MANAGEMENT

Introduction to Project Management, Proposal writing, Project planning and scheduling, Information Technology Context and Process Groups in Project Management, Project Integration Management, IT Project Scope Management, Project Time Management, IT Project Cost Management, IT Project Quality Management, Project monitoring and reviews, IT Project Human Resource Management, Project Communications Management, IT Project Risk Management, IT Project Procurement Management, Report writing and presentation.

ICT3207 – PROFESSIONAL PRACTICE AND ETHICS

Introduction to Legal Concepts, Intellectual property, copyright and patents, Contracts, Liability, Introduction to ethics, Professional ethics, Privacy and the freedom of information, Computer misuse and computer crime, IT and the quality, quantity and organization of work, The need of social responsibility, Social responsibilities/ethics of a manager, Professional skills, Attitude, Professional development: Social etiquette, Dress, Habits, Respect to others/ other professions etc., Compliance to Standards (ISO etc.).

ICT3208 – ENTREPRENEURSHIP

What is a business, Options for Entering into business, The Marketing Plan, Market Research and Product Strategy, Promotional and Pricing Strategies, Distribution Channels, Sources of Financing, How to select people for the Management Team and for the Organization, Selecting a Location, Planning Facilities and Managing Human Resources.

ICT3209 – PRINCIPLES OF ACCOUNTING

Concepts of financial accounting, Practice of book keeping including books of Prime Entry, Ledgers and Trial Balance, Preparation of Trading Profit & Loss and Balance Sheet, Cash flow statement, Bank reconciliation.

ICT3310 – PRINCIPLES AND PRACTICES OF MARKETING

Marketing as an organizational function, Evolution of marketing concepts, Marketing goals and strategies, Consumer behavior, Marketing mix and targeting, Strategies for products, pricing, channeling and promoting products, Brand strategies and brand management, Preparation of a marketing plan.

ICT 3202 – OPERATIONAL RESEARCH

Simplex Method-Theory and Computational Procedure: Efficient Computational Techniques. Simplex and Revised Simplex Method, Decomposition Algorithm and the Bound Variables Algorithm. Duality theorem and Post Optimality Analysis. Transportation Assignment and Allocation Problems: Inventory model, Decision theory, Project and Scheduling by PERT-CPM (Critical Path Method). Network Analysis, Applications.

ICT 3212 – INTRODUCTION TO INTELLIGENT SYSTEMS

Introduction to Intelligent Agents; introduction to problem solving algorithms used in intelligent systems, knowledge representation, introduction to logic concepts, introduction to Prolog, making decisions, Fuzzy Logic; Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, introduction to Artificial Neural Networks; introduction to Natural Language Processing.

ICT 3213 – ADVANCED OPERATING SYSTEMS

Operating system principles; process scheduling and dispatching; memory management and virtual memory; I/O device management, disk scheduling algorithms, process and file system security, reliability and fault tolerance, RIAD and file system reliability; concurrency, deadlock detection and prevention, virtualization, real time processing, distributed processing.

ICT 3411 – GROUP PROJECT

Project identification and proposal preparation, requirement analysis and specification, domain specific and technology specific research and literature review, concept development, software development life-cycle selection, system design and specification, selection of technologies and CASE tools for implementation, use of software engineering best practices, system implementation and testing, system deployment, report writing, research paper writing and publication, project demonstration, project marketing.

4.1.4 FOURTH YEAR PROGRAMME OF STUDY

The course units of fourth year of special degree/ four-year degree programmes are given below.

4.1.4.1 INTERDISCIPLINARY COURSES

IDC 4201 - Scientific Communication

The importance of scientific communication, types of scientific communications, types of scientific papers, structure of a scientific paper, citation styles and bibliographic software, selecting a journal, the peer-review process, responding to reviewer comments, ethics of scientific publishing (COPE), Oral communication and presentation aids, preparing effective PowerPoint presentations and effective delivery of presentations, handling questions, structure of a proposal and effective proposal writing, preparing a budget and budget justification.

4.1.4.2 CHEMISTRY

CHE 4201 - COMPUTATIONAL CHEMISTRY

Molecular Mechanics: Force fields, potential energy functions, inter and intramolecular interactions, empirical parameters; Molecular mechanics calculations, energy minimization, conformational analysis, common force fields and their limitations Lab; CHARMM. **Molecular Dynamics:** Molecular dynamics and Monte Carlo Simulation methods - Importance sampling and Metropolis sampling, application in molecular dynamics, MD methods calculation of thermo parameters in simple system, diffusion coefficients, conductivity, pKa. **Ab initio Methods:** HF-Roothan hall equation, basic function and basic sets [up to 6-311 G, d, f], introduction to electron correlations, calculation of electron density, electrostatic potential, etc. **Semi Empirical Methods:** Introduction and need for semi-empirical methods, CNDO, NDO, MNDO, AM 1, ZDO approximation, comparison of results with ab initio methods for simple chemical systems. **Density Functional Theory:** Density functional theory *vs* Hartree-Fock methods, modelling methods in solid state, recent advances in the field of quantum mechanics, molecular mechanics methods, etc. **Practical:** Molecular mechanics, molecular dynamics, ab initio, semi empirical methods, density functional theory.

CHE 4202 - ADVANCED PHYSICAL CHEMISTRY I

Electrochemistry: Ion-solvent interaction - Expression for ΔH and ΔS and ΔG of ion-solvent interaction, experimental verification of Born Model, ion-dipole model of ion-solvent interaction and expression for heat of solvation, ion-ion interaction - true and potential electrolytes, Debye-Huckel (ion-cloud) theory of ion-ion interactions, limiting and extended forms of Debye-Huckel equation; activity coefficients and ion-ion interaction. **Electrode-Electrolyte Interface:** Thermodynamics of ideally polarizable and non-polarizable interfaces- Lippmann equation; determination of interfacial tension, charge density, surface excess and double layer capacitance by electrocapillary method - Helmholtz, Gouy-Chapman and Stern models of the double layer with discussion of potential and charge distribution inside the double layer-contact adsorption and its determination; Bockris, Devanathan and Muller model of the double-layer. **Electrode Kinetics:** Butler-Volmer equation and high field & low field approximations, charge transfer resistance and polarizability of the interface, concepts of rate determining step, determination of kinetics parameters (io, ks, α) by linear polarization methods, Tafel plots, mass transfer-controlled electrode kinetics. **Transport phenomena** - Migration, diffusion, convection and coupled transport in an electric field, Faradaic current and non-Faradaic current, electrolytic polarization, dissolution and decomposition potential, overvoltage – hydrogen and oxygen overvoltage, Applications; Cyclic voltammetry: Definition of reversibility, charging currents, chronoamperometry: cottrell equation, pulse methods, convection methods, rotating disk and ring-disk voltammetry. **Photochemistry:** Interaction of radiation with matter, photo chemical reactions and their difference with thermal reaction law of photo chemistry, Grotthuss-Drapper law, Stark Einstein law, Lambert law, Beer's law; Organic photochemistry - Selection rules for electronic excitation; Electronic states, quantum yield, excitation sources, filters, fluorescence and phosphorescence; Jablanski diagram, singlet and triplet excited states, chemiluminescence, quenching of excited state, quantum yield, lifetime of excited state, selective quenching, triplet quenchers, energy transfer, triplet sensitization, Stern-Volmer kinetics, LASER, Mechanism of photochemical reactions: Excitation, excited states, primary photolysis, reactive intermediates, secondary reactions; Study of photochemical reactions of carbonyl compounds: Norrish type I and II reactions, photooxidations, photoreductions, photocycloadditions and photorearrangements.

CHE 4203 - SURFACE AND COLLOIDAL CHEMISTRY

Surfaces and Interfaces: Introduction to surface phenomena, the definition of a surface and an interface, absorption and adsorption, surface tension, surface free energy, contact angle, effects of solutes and temperature on surface tension, surface pressure; The Kelvin equation and its applications, vapour pressure above curved surfaces, super cooling and super heating; Comparative description of physisorption and chemisorption, sticking probability and condensation coefficient, adsorption theories, the measurement of surface and interfacial tension, the Gibbs equation, surface activity and surfactants, spreading and wetting, monolayers; Adsorption isotherms, isobars and isosteres, Gibbs adsorption isotherm and its application, Langmuir adsorption isotherm and its application, introduction to multilayer adsorption; Determination of surface areas and molecular cross sections, use of Langmuir trough method, monomolecular films, equation of state for an ideal surface film and molecular areas. **Contact Angles and Wetting:** Definition of the contact angle, the phenomenon of wetting; Hydrophobicity and superhydrophobicity, Young's equation, the measurement of the contact angle; Cassie-Baxter model and Wenzel's model, the critical surface tension. **Micelles and Surfactants:** Classification and purification, stability of colloids, zeta potential, isoelectric point, industrial applications, macromolecules and micelles, foams and emulsions; Definition of surfactants, Structures of different surfactants, the definition of the critical micelle concentration, the energetics of micelle formation, models of micelle formation, applications of surfactants - detergent formulations. Emulsions and foams. An Introduction and application to the Colloidal State.

CHE 4204 - ADVANCED INORGANIC CHEMISTRY II

Bioinorganic Chemistry: Introduction: Metals in biological systems and their role, metalloproteins & metalloenzymes, speciation and specificity of metal complexes *in vivo*; Dioxygen carriers - haemoglobin, myoglobin, haemocyanins and nature of haem dioxygen binding; Transition metals in biological redox reactions: General mechanism of electron transfer, blue copper proteins, iron sulphur proteins, photosynthesis pathway; Distribution and functions of metals in vivo - Chemistry and biochemistry of nitrogen fixation; Environmental bioinorganic chemistry: Delivery of traces of elements to human, therapeutic uses of metals, ligands & complexes, metal induced toxicity and chelation therapy. **Spectroscopic techniques:** NMR spectroscopy of spin ½ nuclei of ^{19}F,^{31}P and spin > ½ such as ^{14}N and ^{11}B, electron spin resonance (ESR), nuclear quadruple resonance (NQR), Mossbauar spectroscopy and their applications in structure elucidation of inorganic and organometallic compounds. **Inorganic polymers**: Chemistry, preparation, characterization and applications of Zeolite, silicones, fullerenes etc.

CHE 4206 - NANOCHEMISTRY

Introduction and classification: Milestone of the development of nanotechnology, Nature's Nanotechnology, lotus effect, Swans feathers etc. Nanoscale architecture; Summary of the electronic properties of atoms and solids - Isolated atom, bonding between atoms, giant molecular solids, the free electron model and energy bands, electronic conduction; Effects of the nanometre length scale - Changes to the system total energy, changes to the system structure, how nanoscale dimensions affect properties, the size dependence of optical properties and concepts of super hydrophobicity, relationship between the surface area effect and quantum mechanical effects, basic mathematics related to the properties observed in nanoparticles. **Nanochemistry:** Preparation methods: Bottom-up synthesis and top-down approach - precipitation, self-assembly and self-organization to design functional structures in 1D, 2D or 3D structures; Principles and Mechanisms of Nanoparticle Growth and Stabilization: Thermodynamics of phase transitions and fundamentals of nucleation growth. Carbon Nanostructures - Introduction; Carbon molecules - nature of the carbon bond, new carbon structures; Carbon clusters - structure of C_{60}, alkali doped C_{60}, electrical, vibrational and mechanical properties of fullerenes. Nano fabrication; Thin films; electrodeposition, physical vapour deposition, chemical vapour deposition, spray pyrolysis, lithography; optical, X-ray, electron beam. **Applications of nanomaterials:** Nanomaterials for Alternative Energy: Nanomaterials as electrocatalysts for Fuel Cells and Nanoclusters in Hydrogen Storage, solar cells, gas sensors, Nanomaterials for biotechnology; Nanomaterials for Drug delivery systems, Biosensor, Biomedical applications, Antimicrobial activity and Protein chromatography, Self-cleaning; super hydrophobicity, photocatalytic, Nanomaterials for environmental remediation and possible health impact of nanomaterials.

CHE 4307 - ADVANCED PHYSICAL CHEMISTRY II

Statistical Thermodynamics : Overview of thermodynamics and its importance and utility; Molecular energy levels from quantum mechanics; Definition of basic concepts and derivations of: Quantum mechanical picture of a system of non-interacting and interacting particles, distinguishable and indistinguishable particles, Stirling's approximation, statistical entropy, configuration and statistical weights, Boltzmann distribution, molecular partition function, Fermi-Dirac and Bose-Einsteinstatistics; Relationship between macroscopic properties of a system and its possible configurations. **Molecular Reaction Dynamics:** Introduction: Drawbacks of Arrhenius theory, the kinetic theory of collision for bimolecular gas phase reactions, relationship between critical energy and the activation energy, probability factor; Activated complex theory, vibrational mode along the reaction coordinate, thermodynamic interpretation of the overall rate constant, application of activated complex theory; Theories of unimolecular reactions: Lindermann theory, The [M]½ value of the unimolecular reactions, weaknesses of Lindemann theory, calculation of k value from Hinshelwood modification, the treatment of Rice-Ramsperger and Kassel, energized complex, Slater's treatment, Rice –Ramsperger-Kassel (RRK model), modification by Marcus (RRKM theory); Liquid phase reactions: Theory of diffusion - Controlled reactions, the theory of absolute reaction rates, activation controlled reactions influence of solvent in liquid phase reactions; Effect of ionic strength and pressure on reaction rates in solutions and Study of fast reactions in solutions. **Advanced Quantum Mechanics:** Theorems of quantum mechanics; Hermitian operators, expansions in terms of eigenfunctions, commuting operators and parity, measurements and superposition states, postulates of quantum mechanics (re-visit), interpretations of quantum mechanics; Many-electron atoms; Molecular Hamiltonian, Born-Oppenheimer approximation, variation principle, potential energy surface, electronic Hamiltonian, Huckel molecular orbital theory, the Hatree and Hatree-Fock methods; Self-consistency, spin-orbit interactions, Condon-Slater rules, introduction to perturbation theory; Electron correlation.

CHE 4308 - ADVANCED ENVIRONMENTAL CHEMISTRY

Pollutants in the Environment: Introduction to environmental organic and inorganic chemicals, Background thermodynamics, emphasizing phase equilibria and the use of chemical fugacity in modelling phase equilibria, Vapour pressure of organic chemicals, Aqueous solubility of organic chemicals and activity coefficients in water, Air-water partitioning, Organic solvent-water partitioning; Toxicology of Pesticides: Types of exposure, terminology used in toxicology studies, measurement of toxicity levels, classifications of pesticides according to toxicity levels. **Reaction Kinetics and modelling:** Introductions to kinetics of chemical transformation in the environment; Complex reaction kinetics; Characteristic time scales; Kinetics at interfaces; Sources of kinetics and mechanistic information; Formulation and calibration of environmental reaction kinetics; Catalysis in different environmental compartments; Linear free energy and structure activity relationships and fate of environmental chemicals; Kinetics of metal complex formation; Chemical transformations of organic pollutants in the environment; Adsorption kinetics and heterogeneous electron transfer mechanisms; Kinetics of colloid systems. **Chemical aspects of waste treatment and management:** Water Treatment: Demand calculations and forecasting, Design of intake structures & pumping, Process design concepts on major treatment units: Aeration, Flocculation, Sedimentation, Filtration, Disinfections (Chlorination, UV, Ozonization), water softening, Application of advanced treatment methods; demineralization, Ultra filtration, Reverse osmosis, Colour & odour removal by activated carbon, Iron removal. Inter-relations between water source management, quality of raw water & choose of treatment processes. Design of transmission and distribution systems including water quality management for ensuring safe drinking water quality. Applicable water quality standards. Wastewater engineering: Preliminary & Primary Treatment: Quantity & Quality of sewage generated, Impact of Future growth & development & change in quality of life on sewage quality & quantity. **Industrial Wastewater**: Selection of appropriate unit operations for the treatment and flow chart of wastewater treatment plant for dairy pulp &paper, electroplating. Biotechnology & Waste Management: Application of biotechnology for the Treatment of Primary & secondary sludge. Different model of anaerobic digestion by combination of attached & suspended growth.

CHE 4309 - ADVANCED ORGANIC CHEMISTRY

Physical organic chemistry: Correlation of Structure with Reactivity; Quantitative treatments of the effects of structures on reactivity; the use of σ, σ, o, σ +, σ- values; reaction constant ρ and its significance. Methods of studying organic reactions: Identification of reaction products, intermediates, trapping of intermediates, isotopic labeling, nucleophilicity and solvent effects, leaving groups, steric effects, substituent effects, neighboring group participation. Addition and elimination reactions solvent polarity, review of kinetics, energetics, Arrhenius theory, Eyring transition state theory, kinetic/thermodynamic control, kinetic isotope effect, Hammett plots, Hammond's postulate, Curtin-Hammett principle, linear free energy relationships. **Pericyclic Reactions:** Introduction; Types of pericyclic reaction: Cycloaddition, electrocyclic reactions, sigmatropic reactions; Interaction diagrams: Aromaticity, antiaromaticity, Huckel systems, Mobius systems, Dewar-Huckel-Zimmerman aromatic transition state concept; Molecular orbitals, molecular orbitals of conjugated polyenes and allyl systems, correlation diagrams, concept of HOMO and LUMO - Fukui frontier orbital approach, Woodward-Hoffmann rules, selection rules and stereochemistry of electrocyclic reactions, cycloadditions and sigmatropic shifts - applications of frontier molecular orbital approach, correlation diagram approach, Huckel-Mobius approach; Sommelet-Hauser, Cope and Claisen rearrangements. **Advanced organic spectroscopy:** Non-first order spectra; simplification of complex spectra (shift reagents in INDOR); ^{13}C-NMR and signal intensities; pulse techniques; nuclear overhauser effect (NOE), Description and applications of the commonly used 2D NMR techniques: H-H correlation (COSY and TOCSY), C-H correlation (HETCOR/HMAC/HSQC), long-range correlation (COLOC/HMBC), internuclear distances (NOESY and ROESY), INADEQUATE , mass spectroscopy (MS); ionization techniques (E1, Cl, FAD, ESI, MALDI etc),mass analyzers (magnetic sector, quadrapole analyzer, FTICR, TOF etc.), interfacing of MS with GC (GCMS) and LC (LCMS), fragmentation of chemical classes of organic compounds. FTIR, CD and ORD in structure elucidation of organic compounds.

CHE 4210 - MOLECULAR AND SURFACE SPECTROSCOPY

Symmetry and Molecular structure: Importance of symmetry in chemistry, symmetry elements and symmetry operation with illustration, point group. C1, Cs, Ci, Cn, Cnv, Cnh, Dn, Dnh, Dnd, C_, D_h, Td, Oh. Multiplication tables for C_{2V}, C_{3V} and C_{2h} point groups. **Molecular spectroscopy:** Electric dipole moment of a molecule: Definition of electric dipole moment, calculation of the dipole moment of a molecule using the dipole moments of individual bonds, transition dipole moment; Absorption of radiation as a microscopic phenomenon; Origins of an absorption spectrum and positions of absorption peaks, decomposition of total energy of a molecule into components, absorption peak heights and widths, microscopic processes that determine the absorption peak height, selection rules, peak widths. **Rotational and Rotational Raman Spectroscopy**: Diatomic molecules, intensity of line spectra, the effect of isotropic substitution, non-rigid rotator and their spectra, polyatomic molecules (linear and symmetric top molecules), classical theory of Raman Effect - Pure Rotational Raman spectra (linear and symmetric top molecules). **Pure Vibrational Spectroscopy and the energy of diatomic molecules**: Simple Harmonic and, anharmonic oscillator, diatomic vibrating rotator, vibration-rotation spectrum of carbon monoxide, Born-Oppenheimer approximation, vibrations of polyatomic molecules, influence of rotation on the spectra of polyatomic molecules (linear and symmetric top molecules), Raman activity of vibrations, vibrational Raman spectra. **Surface Analytical Techniques:** UV photoelectron spectroscopy (PES), Auger electron spectroscopy (AES), Low energy electron diffraction (LEED), Flame emission microscopy (FEM), high resolution electron energy loss spectroscopy (HRELS)

CHE 4212 - PHARMACEUTICAL AND MEDICINAL CHEMISTRY

Course Capsule: History of Medicinal Chemistry, comparison of Western medicine to traditional medicine, Phamacokinetics (ADME process Absorption, Distribution, Metabolism and Excretion), Chemical and physical properties of drugs influencing the ADME. Chemical Modification of Drugs, Prodrugs, Steriochemistry and Drug molecules, Enzyme as site of drug action, Receptors and ligands, Receptor binding and dose response, Synthesis of Drugs: General anesthetics, sedatives and hypnotics, anti-histamines, Antipyretic, analgesic, anti-inflammatory, opieates, NSAIDS, Antibiotics. Clinical Trials

CHE 4213 - CHEMICAL TOXICOLOGY

Basic Principles in Toxicology: Fundamental concepts; Dose-response and structure-activity relationships of toxicants; Absorption, distribution, metabolism, excretion; Basic concepts of the mechanisms of toxicity; action (irritation, narcosis, inhibitory substances, indicating the substance, carcinogenic, mutagenic, teratogenic and allergenic substances and their effects) Role of microorganisms in metabolizing chemicals; Studies of catabolic pathways; chemical aspects of environmental toxicology. Basic knowledge about how the communication systems of the body, the nervous system and the endocrine system is influenced by chemicals. **Chemistry of Toxicology:** Biochemical, cellular, and organ system basis of intoxication; Biotransformation of toxicants; Biochemical mechanisms underlying toxicity; Factors influencing toxic action and biomarkers of exposure; Classifications of toxicants, Effects of various classes of toxicants, including heavy metals and persistent synthetic organics, with a focus on susceptible biochemical/cellular processes of the central nervous and target organ systems; Emphasis will be placed toexamines how the chemistry of elements is played by a cell and identifies chemical and biological factors that govern a cell's selection of certain elements for biological reactions and processes. Genetic toxicology and ionizing radiation: The part includes basic knowledge about genetic injuries and general genetic testing methods and mechanisms behind chemically induced injuries and injuries after ionizing radiation. **Toxicology in the society**: Environmental toxicology, food toxicology, clinical toxicology, epidemiology, risk assessment.

CHE 4814 - RESEARCH PROJECT AND SEMINAR

This is a compulsory course for the students who are selected for Special Degree in Chemistry at the fourth year. The course consists of research work, which should last about six months at the bench with a selected supervisor, submission of a final research report and some lectures on research methodology, literature search and how to write a final research report. The supervisor can be from the internal academic staff of Rajarata University of Sri Lanka or from a recognized research institute. Students are free to choose a research topic based on their research interests with the help of a supervisor. Some research topics will be made available by the academics. In order to approve the proposed project, it should be primarily chemically-based. At the end of the semester, the student must submit a comprehensive report of the work accomplished to the research adviser. A copy of the report also must submit to the Head of the department. Grade will be awarded to the comprehensive report and for the final presentation.

CHE 4215 - SOLID STATE CHEMISTRY

Types of inorganic compounds with two and three different elements: Discrete molecules, layer structures, giant structures; CsCl, NaCl (rock salt), ZnS (zinc blende &Wurtzite), CaF_2 (fluorite), Na_2O (antifluorite), TiO_2 (rutile), ilmenite, spinel, perovskite structures; The atomic, covalent, Van der Waals and ionic radii and their determinations; The radius ratio and its determinations for coordination numbers, 3, 4, 6 & 8. Thermal properties: Specific heat capacity, Einstein model, plank distribution law, Defects and Non-stochiometry: (a) Lattice defects: inherent thermodynamic defects, Schottky and Frenkel defects, equilibrium concentration of Schottky and Frenkel defects, (b) Other imperfections: Point-defects, line defects, plane defects, edge and screw dislocations, hall effect, colourcentre, (c) Non-stoichiometry: Non-stoichiometry alkali metal halides, transition metal oxides and sulphides, (d) Impurity: Foreign impurity atoms or ions, impurity in a semi-conducting elements, (e) Experimental investigation of lattice defects: Ionic conductivity and self-diffusion, density. Band theory of solids: Introduction to energy bands, metals, semiconductors, insulators, the Kronig-Penny model, the Fermi–Dirac distribution, charge carriers in semiconductors, intrinsic and extrinsic semiconductors, direct and indirect band gap semiconductors, metal-semiconductor junction. **Thermal and Microscopic Methods of Analysis.** Introduction to thermal method of analysis, thermogravimetry (TG), differential thermal analysis (DTA), derivative thermogravimetry (DTG) and differential scanning calorimetry (DSC); Some applications of thermal methods in ceramics, cements, polymers etc.; Characterization of solids by scanning electron microscopy (SEM), atomic force microscopy (AFM), transmission electron microscopy (TEM) and X-ray diffraction (XRD).

4.1.4.3 PHYSICS

PHY 4201 - BIOPHYSICS

Introduction to Biophysics: Introduction to a new world, A physicist's approach to Biophysics. Water: Introduction, Structure (molecular structure, liquid and solid), unusual physical properties, Bulk vs. local structures, Diffusion and chemical reactions in water, solute and the solvent power of water. Structures (from 0.1 - 10 nm and larger): Software to display and analyze biological structures, Solvents, Small molecules, Medium-sized molecules (Components of large biomolecules), Forces and free energies, Biopolymers, Macromolecules. **Biomolecules &biomolecular assemblies**: Measuring properties of 3-D aggregates, small aggregates, large aggregates, 2-D aggregates (membranes). Putting a cell together (physical sketch): Minimal, prokaryotic, and eukaryotic cells, physiology (selective overview); reproduction, DNA, and the cell nucleus, sensors and recognition, responding to the outside world without eyes. Electrical and Magnetic Properties of cells: Electrical properties of body tissue (electrical conduction through blood and tissue), Nerve conduction (Cell membrane and Ion distributions, types of cell membrane excitations, model of electrical conduction along an axon), Ion channels, hair cells, balance, taste and smell; Electrical properties of the heart; Electrical signals in the brain; Effects of electric shock, Magnetic properties (magnetic field from an axon, magnetic sense), Electromagnetic waves. Light and life: Light (our energy source), Crucial differences between one 5 *eV* and 2.5 *eV* photons, Properties of photons, Scattering and reflection, Absorption spectra, Emission spectra; Einstein relations between absorption and emission of atoms, Intersystem crossing: singlets ($S = 0$) to triplets ($S = 1$), Energy transfer (FRET). Mechanics and Dynamics: Conservation laws, Newton's laws, forces and torques, Friction, Gravitational forces, Volume changes and compressibility, Stress and strain; Dissipation, Inertia, Disorder, Fluids and turbulence. Diffusion & polymer conformation: Review of kinetic theory of gases (Implications for biomolecular averaging), 1-D random walk (probabilities and distributions), Spreadsheet model for a 1-D random walk, 3-D random walk, Diffusion in the bulk, reprise of photosynthetic light harvesting, biopolymers—random reprise.

PHY 4203 - CLASSICAL MECHANICS

Newtonian Mechanics: Inertial Frames, Newton's Laws of Motion, Central Forces, System of Particles, Rotating Coordinate Frames, **Rigid Body Motion:** Angular velocity and Eulerian angles, Euler's equation of motion, Centrifugal and Coriolis forces, **Lagrangian Mechanics**: Generalized coordinates and generalized forces and momentum, the Lagrangian equation of motion, constraints and method of Lagrange's undetermined multipliers, **Hamiltonian Mechanics**: Hamiltonian's equation of motion, Poisson's Bracket.

PHY 4208 - CHARACTERIZATION TECHNIQUES

Introduction, **Thermal Analysis**: Thermo Gravimetric (TG) analysis, Differential Thermal Analysis (DTA), Differential Scanning Calorimetry (DSC), X**-Ray Diffraction (XRD)**: Basic concepts, Bragg's law, Reciprocal lattice, The use of XRD in materials characterization and the interpretation of diffraction patterns, **Infra-Red Spectroscopy:** Vibrational spectroscopy, Identification of matrix and contaminants. **Light Microscopy**: Basic principles of light microscopy, The uses of reflected light, polarized light and confocal imaging modes, **Electron Microscopy:** Physics of the electron interaction with a material, Electrostatistic versus Magnetic lenses, **Scanning Electron Microscopy (SEM)**: Design, The electron probe size, Imaging modes, Secondary and Backscattered imaging modes, Crystallographic effects, **Transmission Electron Microscopy (TEM):** Design, Illumination system, Lenses, Apertures, Resolving power of the TEM, Electron diffraction: Kinematical theory and Dynamical theory, Kikuchi lines and Maps, Amplitude contrast from lattice defects, Phase contrast, Magnetic contrast, Sample preparation techniques, **Analytical Microscopy:** Generation, detection and analysis of X-rays, Wave Dispersive Spectrometry (WDS) and Energy Dispersive Spectrometry (EDS**),** Qualitative analysis, Point analysis, Electron Energy Loss Analysis (EELS), **Scanning Transmission Electron Microscopy, (STEM):** Design, Image contrast, **Atomic Force Microscopy (AFM)**: Basic principles of AFM, **Auger Electron Spectroscopy and Microscopy**: **Secondary Ion Mass Spectrometry (SIM)**: Sputtering processes, Basic principles of SIMS, and the static, dynamic and imaging modes. Mass spectral resolution, interpretation, quantification and matrix effects, Comparison of available instrumentation.

PHY 4209 - PHYSICS OF SEMICONDUCTOR DEVICES

Introduction to semiconductors: Electronic states and charge carriers, Drift of carriers in electric and magnetic fields, drift-diffusion equation. **Charge Devices:** Revise of p-n junctions, Bipolar transistors, Field Effect transistors, light emitting devices, photovoltaic devices, charge-transfer devices and semiconductor memories. **Mesoscopic Devices:** Quantum wires, Quantum dots, electron turnstile devices, quantum hall devices. **Spin Devices:** Spin dependent transport in metal and magnetic multilayer, Giant magnetoresistance, magnetic read heads, non-volatile memories, spin transistors.

PHY 4210 - ADVANCED QUANTUM MECHANICS

Many electron atoms, Electronic Hamiltonian, Independent particle model, spin orbital, Antisymmetric wave functions, Permutation operators, Slater determinant. Hartee – Fock theory (HF), Matrix of the HF equation, Variation principle and variation methods, Perturbation method, Molecules and Born Oppenheimer approximation, Quantum mechanical interpretation, molecular orbital. Electron – electron correlation, Post HF methods, Density Functional Theory (DFT), Advantages.

PHY 4211 - NANOMATERIALS AND NANOTECHNOLOGY

Introduction to micro and nanomaterials, Carbon Nanotubes: Fabrication and characterization, Electronic spectra, Applications, Quantum dots: Schrödinger's equation for confined systems, Electronic states and transitions, Nanoporous polymers and their applications in water purification, Photo-catalytic fluid purification, Energy conversion; Hierarchical self-assembled nano-structures for adsorption of heavy metals, risk from nanoparticles, Health and environmental issues.

PHY 4312 - STATISTICAL THERMODYNAMICS

Boltzmann, Fermi – Dirac and Bose – Einstein weight functions, relationship between the microscopic properties of a system and its possible configurations. Molecular partition functions, Canonical ensemble, Canonical partition function, Translational, rotational, vibrational and electronic partition functions data, Statistical thermodynamics to realistic systems.

PHY 4613 - PROJECT

Students will carry out individual projects under the supervision of senior academic staff members**.**

PHY 4314 - CURRENT TOPICS IN CHEMISTRY AND PHYSICS

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

4.1.4.4 BIODIVERSITY AND CONSERVATION

BDC 4201- ENVIRONMENTAL POLICIES AND MANAGEMENT

Principles of environmental Management, current practices in environmental protection and legislation, Policy formulation process in Sri Lanka, Environmental conservation and management policies in Sri Lanka, System of granting approval for development projects and high polluting industries in Sri Lanka, Environmental Protection licensing (EPL) process, Environmental standards, Environmental management under provincial administration, National legislation, International conventions: Biodiversity convention: Current practice in conservation, application of biodiversity convention in Sri Lanka.

BDC 4202 - WETLAND CONSERVATION AND MANAGEMENT

Basic Concepts on Wetland Ecology, Wetland characteristics, Wetland vegetation and adaptations, Wetland biogeochemistry with special reference to the importance of inorganic and organic compounds transformations in wetlands, Wetland zonation, Wetland functions, values and economic benefits, Major threats to wetlands, Biological diversity of wetlands, Factors affecting animal and plant diversity in wetlands, Monitoring of Wetlands, Managing hydrology; Control of Siltation and Pollution, Restoration of degraded wetlands and wetland creation, along with the construction of wetlands for pollution abatement. Wetland conservation and management and Sustainable use of wetlands.

BDC 4203 - FOREST CONSERVATION

Introduction to the Forestry Sector of Sri Lanka and Overview of Natural Forests in Sri Lanka, Multiple-Use Natural Forests: Services and Products, Non-Wood Forest products, Wood Products and Timber Processing, Assessment of Forest Resources and Inventory Process, Forest Policy, Legislation and Institutions, Conservation of Biodiversity in Forests, Forestry in Soil and Water Conservation, Forest Protection and Forest Influences, Carbon Trading and Sequestration, REDD and REDD+ programmes, Agroforestry and Agroforestry Systems, Social Forestry and Related Systems, Forest Economics and Marketing, Silviculture and Silvicultural Systems, Tree Improvement Methods, Forest Plantations, Home gardens and Non-Forest Tree Resources, Forestry Research, Extension and Future Trends in Forestry.

BDC 4204 - ADVANCED GEOGRAPHIC INFORMATION SYSTEMS

Introduction to Advances in GIS Technology, Accuracy of Geo-spatial Databases, Uncertainty of Geo-spatial data, locational Uncertainty Processing, attribute uncertainty processing, S-Buffer Model; Digital Elevation Models. The Analysis of Discrete Entities in Space: Operations on attributes of Geographic Objects, Cartographic operations, Pattern Detectors: Nearest neighbor analysis, Application; Characteristics of Linear Features: Network analysis, Directional statistics; The spatial pattern descriptors, Spatial indices, Customization and Automation in GIS: Customization to end user needs, Introduction to programming in GIS, Automation in GIS functionality; GIS on Internet: Scope and concept of Open GIS, Developing an internet GIS.

BDC 4205 - ECONOMICS OF BIODIVERSITY

Definitions for Economics, utility, goods, services, demand, supply, consumer, producer, factors of production. economics as a social science, rationality, Economic Behaviour in developing countries and in developed countries, culture, institutions and mentalities, Evolution of the discipline Economics, Market equilibrium, producer surplus, consumer surplus, price mechanism, central planned economies and mixed economies, income, consumption, savings and investments, MPC, MPS, APC and APS, theories of consumption in general and with reference to Biodiversity, main economic schools of thought: classical, neo-classical, Keynesian, New Classical and New Keynesian.

BDC 4206 - LIMNOLOGY AND CONSERVATION OF AQUATIC RESOURCES

Ecological concepts and function of various aquatic systems (inland and marine), Light energy, thermal regime, water movement and mixing process, nutrient cycle and budget, trophic dynamics and biological productivity in aquatic systems, Pollution of aquatic system: water quality, degradation, indicators of water pollution, pollution mitigating measures, conservation of aquatic resources and biodiversity

BDC 4207 - COASTAL AND MARINE BIODIVERSITY CONSERVATION

Coastal communities and their ecological and economic importance, Problems and threats associated with coastal and marine ecosystem, Impacts of anthropogenic activities, Natural events including, Tsunamis and tidal waves on coastal production systems, Protected marine organisms of the Sri Lankan Sea, Use of GIS and remote sensing and mapping on the evaluation and assessment of coastal resources, Participation and role of the government, NGOs and the coastal communities in the sustainable utilization, management and governance of coastal resources, an overview of laws relevant to biodiversity and environmental protection of coastal ecosystems.

BDC 4208 CURRENT TOPICS IN BIODIVERSITY CONSERVATION

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

BDC 4209/ FAM 4209/ MIB 4209 IN-PLANT TRAINING

Training in a research institute/industry/business venture relevant to the Degree Programme, under a professional supervision; Hands on experience in all aspects in functioning of an organization, Application of knowledge and skills in work place situations, Adherence to protocols, Quality management and standards, Management structure and legal framework of an organization.

BDC 4810/ FAM – 4810/ MIB - 4810 RESEARCH PROJECT

A research project is assigned to each student under the supervision of a senior academic staff member. The projects can be carried out in the areas of Ecology, Biodiversity, Wildlife conservation, Fisheries Management, Aquaculture, Biotechnology, Molecular biology and Microbiology. Before commencement of the research work, a proposal should be submitted including plan, the methodology of the project and expected outcome and presented at a seminar before a panel of examiners. Progress of the project should be presented in the 10th week of the semester and a report should be submitted to the supervisor. A dissertation should be submitted before the end of the academic year on or before an agreed date by following the given thesis guidelines. Finally, the findings of the project should be presented before a panel of examiners.

4.1.4.5 FISHERIES AND AQUACULTURE

FAM 4201 - FISHERY RESOURCES MANAGEMENT

Marine fishery resources – Deep sea, offshore and coastal Resources; Brackish water fishery resources – Lagoons and estuaries; Inland fishery resources – Streams, rivers, reservoirs, perennial and seasonal tanks; Importance and constraints in fish stock assessments; Development of empirical models for fish yield predictions; Population dynamics; Overfishing; Community based fisheries management; Co-management of fishery resources; Role of legislature in fisheries management, use of GIS in Fisheries; Pollution and its effects on fisheries and aquaculture.

FAM 4202 - AQUACULTURE ENGINEERING

Hydrological information for design and operation of aquaculture systems, Soil engineering for design of ponds, canals and dams, Design and construction of fish farms, ornamental aquatic plant production centers and maintenance of aquafarms, Pond construction engineering, design and construction of fish cages, tanks, and other impounding structures, hatchery units, classification and design of different types of water pumps, types of aeration and filtration devices used in ponds, their design and construction. Waste management techniques in aquaculture production, biofiltration system used in ponds, type of aerators, degassing etc. Water recirculation systems

FAM 4203 - AQUAFARMING OF MACROPHYTES

Course Capsule: Introduction to aquatic and amphibious plants and ornamental aquatic plants, Ornamental properties and adaptations of aquatic and amphibious plants, Water bodies of Sri Lanka, Zonation of Lentic water bodies and their plant diversity, Native and introduced aquatic plants of Sri Lanka, Marine angiosperm and other angiosperms in saline and brackish waters, Aquatic weeds and Invasive Alien Species (IAS): their natural balance and governing factors in natural habitat; Menace of aquatic weeds, Major aspects in the management of aquatic weeds, Flowering and foliage ornamental aquatic plants and their important economic and ecological aspects, Methods of propagating aquatic plants, Designing aquaria, ponds, water gardens and terrariums, Legislation, Quarantine, feasibility and future prospects of ornamental aquatic plant industry in Sri Lanka. Seaweeds: their biology, introduction including history, methods of seaweed farming and harvesting, nutritional value, medicinal importance and industrial uses, Necessity, feasibility and future prospects of seaweed farming in Sri Lanka.

FAM 4204 - FISH NUTRITION AND GROWTH

Principles of nutrition, nutrient requirements of different fish species, essential nutrients and their functions, artificial and natural feed types, deficiency symptoms, nutritional bioenergetics, vitamins and mineral mixtures, nutrient sources, evaluation of ingredients, toxins in ingredients, larval feeds, grow out feeds, supplemental feeds, complete feeds, brood stock feeds, culture of different live feed types – Artemia, Daphnia, rotifers etc., feed formulation, feeding regimes and feed manufacture, problems in storage and preventive measures, diet analysis and nutritional evaluation, feed management, feeding methods, feeding rates and supplemental feeding

FAM 4305 - FISH HEALTH MANAGEMENT

Principles of fish health management; Economic importance of health management; Predisposing factors; Environmental stress; Introduction to infectious and non-infectious disease agents and processes in cultured organisms; Infectious diseases: bacteria, fungi, viruses, parasites, host pathogen and environmental relationship; Clinical signs, behavioral changes and pathology; Disease diagnosis, microbiological and other techniques involved in diagnosis; Prevention of diseases – tracing and eliminating sources of infection, disinfection; Control-isolation, quarantine; Non-infectious diseases - dietary deficiencies, genetic abnormalities, neoplasms; Treatment methods, disease management.

FAM 4306 - POSTHARVEST TECHNIQUES IN FISHERIES

Principles of fish health management; Economic importance of health management; Predisposing factors; Environmental stress; Introduction to infectious and non-infectious disease agents and processes in cultured organisms; Infectious diseases: bacteria, fungi, viruses, parasites, host pathogen and environmental relationship; Clinical signs, behavioral changes and pathology; Disease diagnosis, microbiological and other techniques involved in diagnosis; Prevention of diseases – tracing and eliminating sources of infection, disinfection; Control-isolation, quarantine; Non-infectious diseases - dietary deficiencies, genetic abnormalities, neoplasms; Treatment methods, disease management

FAM 4207 - FISHERIES SOCIOECONOMICS

Introduction to economics; factors affecting the economics of aquaculture and fisheries in micro and macro scales; production economics and marketing socioeconomics; investment planning and economic feasibility analysis; farm income concept and productivity valuation; farm budgeting and cash flows; record keeping and accounting; profit maximization, laws, regulations and constrains; bioeconomic analytical models; current and potential markets, evaluation of the market potential, market development and entry. Sociological factors in the fisheries sector development.

FAM 4208 - CURRENT TOPICS IN FISHERIES AND AQUACULTURE MANAGEMENT

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

4.1.4.6 MICROBIOLOGY

MIB 4201 - APPLIED MYCOLOGY

Morphological, physiological and biochemical characteristics of yeast and filamentous microscopic fungi important in the food industry , their uses and undesirable effects such as deterioration of food, contamination and mycotoxin formation; fungi as agents of biodeterioration in cultural artifacts, role of fungi in medical biotechnology and biodegradation of organic matter, strategies for development of mycoherbicides, biological control of fungal diseases on crops, Symbiotic associations of fungi, types of mycorrhizae, functions of mycorrhizal fungi in forest and agricultural ecosystem, commercialization of arbuscular mycorrhizal biofertilizers, fungi as plant growth promoters and plant disease suppressors, marine and fresh water fungi and their applications, review of nutritional and medicinal value of fungi, mushroom production technology, biocontrol of mushroom pathogens, introduction to lichens, lichens as bioindicators, medicinal value of lichens and lichenin acids, modern trends in applied mycology.

MIB 4302 - MEDICAL MICROBIOLOGY

Normal microbial flora, introduction to bacterial diseases, Different groups of bacterial pathogens, medically important fungi, specimen collection and processing, isolation and identification of pathogenic bacteria, Antibiotics Susceptibility Testing (ABST), Mode of Action of Antimicrobial Drugs, Disposal of microbiological waste.

MIB 4103 - MOLECULAR MICROBIOLOGY

Quorum sensing, Bacterial two component systems, Bacterial secretion, Protein trafficking in eukaryotic microbes, Bacterial chemotaxis, Sporulation as a means of coping with environmental stresses, Bacterial DNA repair systems, Drug resistance mechanisms, Signal transduction cascades in microbes, Avoidance of host defense, New developments in the field of Molecular Microbiology.

MIB 4204 - MICROBIAL TAXONOMY

Place for archeae, bacteria and fungi in three-domain and five-kingdom classification and in phylogeny, Taxonomy vs classification vs identification, Nomenclature: International Code of Nomenclature of Bacteria (ICNB) and Beygey's manual, International Code of Botanical Nomenclature (ICBN); Phylogenetic relationships of prokaryotes, Phylogenetic relationships of fungi and fungi-like organisms, Characteristics used for identification of bacteria: Structural, biochemical, physiological and serological properties, genetic relatedness (base composition, DNA melting curve, nucleic acid hybridization, DNA sequencing, signature sequences);Major groups of prokaryotes, Fungal nomenclature and classification, Fungi and Fungi-like organisms, Fungal genomics and taxonomy, Methods in fungal taxonomy

MIB 4205 - TECHNIQUES AND STRATEGIES IN MOLECULAR BIOLOGY

Concepts of throughput and resolution, Blotting and in situ hybridization, High resolution live cell imaging, DNA sequencing; Sanger sequencing, pyro-sequencing and next generation sequencing, DNA synthesis, genome editing, Directed mutagenesis & protein engineering, Tools for DNA methylation analysis, DNA libraries, Expression profiling, Proteomics, Protein sequencing, Tools for protein-protein interactions and PTM analysis.

MIB 4206 - MOLECULAR BIOTECHNOLOGY

Fundamentals: Recombinant technology, synthesis, sequencing and amplification of DNA, manipulation of gene expression, Medical biotechnology: molecular diagnostics, therapeutics, novel vaccines, MABs; introduction and applications, SABs and applications, gene therapy and stem cell therapy. Agricultural and environmental biotechnology: bioremediation and biomass utilization, transgenics and micropesticides, Food biotechnology: commercial production of fructose and alcohol; improvements, synthesis of L- Ascorbic acid and amino acids. Intellectual property rights and patenting

MIB 4207 - MICROBIAL GENETICS

Genome vs. cell size: prokaryotes and eukaryotes, Bacterial DNA transfer; Natural transformation, Transduction & Conjugation; Extra-intrachromosomal elements: Plasmids, IS elements, Transposons, Integrons & Mu elements; Control of gene expression: Gene regulation in prokaryotes & eukaryotes, Homologous recombination; Bacterial & eukaryotic , Genetics of Differentiation: Fruiting in Myxobacteria, Heterocyst development in Cyanobacteria; Protein Phosphorylation: hexose phosphate transportation, Nitrogen & Phosphate regulation; Fungal genetics: Yeast genetics and Genomic elements, Tetrad analysis; Viral genetics: lytic cycle and lysogenic cycle; Genetics of Achaea.

MIB 4208 - CURRENT TOPICS IN MICROBIOLOGY

Reviewing a scientific article in its manuscript stage, writing a review article in student's own subject area presentation of a summary of the review.

4.1.4.7 COMPUTER SCIENCE

COM 4201 - Introduction to Mobile Computing

Introduction/Problem Motivation, OS support for small devices, Wireless technologies (CDMA, Bluetooth, etc.), Routing and transport in mobile/wireless environments, Ad hoc routing protocols, MEMS/Micro sensors, Next generation naming (IPv6, NAT), Replication/Consistency in wide-area systems, Persistent storage: Caching content (dynamic/multimedia) distribution, Resource allocation, Next generation applications "Convergence" (Computer, telephone, multimedia, home entertainment).

COM 4202 - Bioinformatics and Computational Biology

Overview of DNA and Protein Sequences, Genomics, WEB Sites and Data Banks of Proteins, DNA Sequences, and 3D Structures, Searching and Matching on String, Arrays and Trees, Computer Analysis of Sequence Data, Regularities, Statistics, Sequence Comparison and Alignment, Two and Multiple, Local and Global, Phylogeny and the Inference of Evolutionary trees, Computational Aspects of Physical Mapping and Sequence Assembly, Computer Analysis and Prediction of Protein Structure, 3D Matching, Export Techniques to Data Mining, Compression, DNA Computing.

COM 4203 - Geographical Information System

Introduction: Definitions, applications, and elements of GIS; Hardware and software for GIS; Fundamental Concepts: Database concepts, spatial concepts; Models of geospatial information; Representation and algorithms; Structures and access methods; Architectures; Interfaces; Spatial reasoning and uncertainty; Temporal and spatiotemporal information systems; Implementing web based GIS solutions using Open Source Software.

COM 4604 - Research Project

Each fourth-year student is required to do a research project in Computer related area under the supervision of a senior academic staff member. Students are expected to apply the knowledge gained throughout the programme.

4.1.4.8 INDUSTRIAL MATHEMATICS

MAT 4301 – OPERATIONS RESEARCH I

Queuing Theory: Introduction, Characteristics of Queuing systems, Poisson Process and Exponential Distribution, Transient and steady states, Poisson Queues, Non-Poisson Queuing Systems, Queues in Series, Queuing Control. **Game Theory:** Introduction, Two-Person Zero-Sum Games, the maximum and Minmax Principle, Games without Saddle Points, Mixed Strategies, Graphical Solution of Games, Dominance Property, The Modified Dominance Property, Reducing the game Problem to a Linear Programming Problem, Minmax and Saddle Point theorems, Fundamental Theorem of Games. **Sequencing:** Introduction, Sequencing Problem, Terminology, Notations and Assumptions, Problems with n-Jobs and Two-Machines, Optimal sequence Algorithm, Problems with n-jobs and Three-Machines, Problems with n-jobs and n-machines, graphic solution.

MAT 4302 – FINANCIAL MATHEMATICS

An introduction to options and markets, Interest and present value analysis, Geometric Brownian Motion, Pricing contact via arbitrage, Arbitrage theorem, Black Scholes option pricing formula. The binomial option pricing model, more results on options, valuing by expected utility, Exotic options.

MAT 4303 – DYNAMIC PROGRAMMING

Introduction, The recursive Equation approach, Characteristics of Dynamic Programming, Computational Procedure, Calculus Method of Solution, Tabular Method of Solution, Some Applications in Production, Solutions of Linear Programming, Problems by Dynamic Programming.

MAT 4304 – OPERATIONS RESEARCH II

Inventory Management: Introduction, Inventory Control, Techniques of Inventory Control, Economic Lot Size Problems, Problem of Economic Order Quality (EOQ) with shortage, Multi-Item Deterministic Problem, Buffer Stock or Safety stock, Inventory Control with Price Breaks, Dynamic Programming and Inventory Control, Queuing Theory and Inventory Breaks, Queuing Theory and Inventory Control. **Replacement Problem, System Reliability:** Introduction, Replacement of items that deteriorate with time, Replacement of items that fail completely, Application of Renewal Theory, System Reliability. **Simulation:** Introduction, Elements of a simulation model, Even-type simulation, Generation of Random phenomena, Steps in Simulation, Simulation languages, Simulation Techniques applied to Inventory Problems, Simulation Techniques applied to Queuing Problems.

MAT 4305 – STOCHASTIC PROCESSES

Introduction to Stochastic processes: Markov Chains, Markov Processes with Discrete state space, Markov Processes with Continuous state space, Stationary processes, Branching Processes, Stochastic processes in Queuing and Reliability.

MAT 4306 – OPTIMIZATION MODELING

Optimization models in Linear programming, nonlinear programming and Integer programming. Students are expected to develop reasonable modelling skills allowing them to cast appropriate real world problems as optimization problems and solve them with available software.

MAT 4307 – DESIGN OF EXPERIMENTS

Comparison of Two Samples (Independent, Dependent), One Way ANOVA: Assumptions, Normal Theory, F-Tests, Multiple Comparisons: LSD Methods, Tuckey's Method, Bon-Ferroni Method, Sceffe's Method, Duncan's Multiple Range Method. Two-Way ANOVA: Normal Theory, Randomized Block Design, The Two Factor Factorials, Confounding, Introduction to analysis of Covariance, Latin Square.

MAT 4608 - PROJECT WORK

Students are expected to carry out an independent research project on a topic assigned to him/her under the supervision of a senior staff member or spend 6 weeks in industry working in a relevant project. At the completion of the project, students are expected to write a report and make a presentation.

MAT 4309 – COMBINATORICS

Recurrence relations and generating functions: Computing solutions to recurrence relations, The principle of Inclusion and Exclusion, Latin squares, System of distinct representatives, Extremal set theory. **Steiner triple systems:** Direct construction, Recurrence construction, Tournaments and Kirkmen's school girl problem, Further Graph Theory, Networks, Matroids, Designs, Hadamard matrices. **Error-Correcting codes:** Linear codes and Hadamard codes.

MAT 4310 – COMPUTATIONAL MATHEMATICS

Numerical Solution of the Initial Value Problem for ODEs: Runge-Kutta techniques and error estimation, Adams predictor-corrector techniques and error estimation, BDF predictor- corrector techniques for stiff ODEs, Properties of methods. How to select appropriate method for a particular problem, Error term, order of error, convergence, stability. **Boundary Value Problems for ODEs:** Finite Difference Techniques, Order of error, convergence. **Iterative Solution of Large, Linear Systems:** Gauss-Seidel, Residual Correction, Positive-definite systems, Conjugate Gradients, Convergence and how to accelerate it. **Numerical Solution of Parabolic PDEs:** Euler's Method, Crank Nicholson, Order, convergence, stability. **Numerical Solution of Elliptic PDEs:** Finite Difference Approximation, Introduction to Finite Element Method. **Problem Solving using MATLAB:** Computational problem solving using MATLAB from section above.

4.1.4.9 HEALTH PROMOTION

HPT 4501 - CHILD WELL BEING AND DEVELOPMENT

Operationalizing the concept of wellbeing as applied to children. The impact, on mortality and morbidity of children, of activities which are designed primarily to improve wellbeing. The 'development' perspective as a special issue in child health. Understanding the range of needs for optimal development. Improving family functioning as a key means to improving child wellbeing. Community processes and community health as a contributor to child health and wellbeing. Improving community processes through and for child health promotion. Biologically and social factors influencing child health. Determinants of child and maternal morbidity and mortality. Prevention of child abuse. Children with special needs and services relevant to such children.

HPT 4202 - REDUCTION OF THE SPREAD OF SEXUALLY TRANSMITTED DISEASES

Range of diseases and their modes of transmission. Preventive measures. Individual based and population-based measures. Issues related to power and authority within sexual relationships. Helplessness and victimization. Social norms and attitudes that need to be addressed. Examples of successful national strategies and unsuccessful ones. Reaching the correct mix of preventive strategies. Skills required for implementing effective interventions.

HPT 4503 -REDUCTION OF TOBACCO, ALCOHOL AND OTHER DRUG RELATED HARM

Range of harm produced by the use of these different substances. Misconceptions about causes versus associations. Factors that influence initiation of use and progression. Strategies used in promoting use of these substances. Commercial influences and non-commercial influences. Social roles played by these substances. Power relationships and acquiescence in or imitation of substance use, Interventions presumed to ameliorate problems related to substance use versus those demonstrated to do so. Global, national and other macro level policies. Local action to reduce the harm. The range of interventions required for a comprehensive approach. Skills and attitudes needed for different interventions.

HPT 4204 - REDUCTION OF SUICIDE

'Understanding' suicide. Perceptions of suicide. Comparisons of variations within localities and trends. Reasons for the popularity of certain explanations of suicide and unpopularity of others. Recorded changes in suicide rates with specific interventions. Individual–centred psychological explanations of causes. Socially based explanations. Successes and failures of socially based interventions. The role of the mass media in preventing and promoting suicide. Community based interventions and the potential for paradoxical results. Skills required in implementing a community-based suicide prevention activity.

HPP 4801 – PROJECT PART 1

Identifying a potential area for the individual research project. Review of literature. Designing the intervention. Developing a project proposal. Proposal reviewing process. Ethical consideration.

Project implementation: Engagement with a selected community/setting. Base line data collection. Initiating a process.

HPP 4802 – PROJECT PART II

Project implementation: Planning the intervention with the community. Implementing intervention. Data collection. Interpreting of the findings.

Dissertation writing. Communication and dissemination of the findings.

4.1.4.10 INFORMATION AND COMMUNICATION TECHNOLOGY

ICT 4201 – ICT FOR EDUCATION

Analyze and critique the roles and rationales for ICT in education, Apply a range of theoretical perspectives systematically to ICT in education, Evaluate critically the nature and extent the impact of ICT' on educational practices, society and various stakeholders, Summarize the basic literature in educational technology in selected areas, based on the specific needs and interests, Produce a research paper on a topic which highlight the use/impact of ICT on education, for example, instructional development, technology integration, internet pedagogy, Examines the process used to design educational technology products, Study the relevant theories of instructional design and apply proven procedures for designing, developing, implementing, and evaluating objectives-based instruction, Examine media-based instructional materials and evaluate their effectiveness in learning environments, best practices that utilize modern technologies.

ICT 4302 – INTELLIGENT SYSTEMS

Artificial Intelligence: Introduction, Intelligent Agents; **Problem Solving:** Solving Problems by Searching, Beyond Classical Search, Adversarial Search, Genetic Algorithms, Constraint Satisfaction Problems; **Knowledge and Reasoning:** Logical Agents, First-Order Logic, Inference in First-Order Logic, Prolog, Classical Planning, Planning and Acting in the Real World, Knowledge Representation; **Uncertain Knowledge and Reasoning:** Quantifying Uncertainty, Probabilistic Reasoning, Probabilistic Reasoning over Time, Making Simple Decisions, Making Complex Decisions, Fuzzy Logic; **Learning:** Learning from Examples, Knowledge in Learning, Learning Probabilistic Models, Reinforcement Learning , Artificial Neural Networks; Communicating, Perceiving, and Acting; **Natural Language Processing:** Natural Language for Communication, Perception, Robotics.

ICT 4303 – ADVANCED COMPUTER NETWORKS

Scaling IP Addresses: Scaling networks with NAT and PAT, DHCP, WAN Technologies: WAN technologies overview, WAN technologies, WAN design, PPP: Serial Point-to-Point links, PPP, PPP configuration, ISDN and DDR: ISDN concepts, ISDN configuration, DDR configuration, Frame Relay: Frame relay concepts, Basic frame relay configuration, Introduction to Network Administration: Workstations and servers, Network management, Emerging Technologies: Basics of optical networks, Optical transmission and multiplexing.

ICT 4204 – MOBILE COMPUTING

Introduction/Problem Motivation, OS support for small devices, Wireless technologies (CDMA, Bluetooth, etc.), Routing and transport in mobile/wireless environments, Ad hoc routing protocols, MEMS/Micro sensors, Next generation naming (IPv6, NAT),

Replication/Consistency in wide-area systems, Persistent storage: Caching content (dynamic/multimedia) distribution, Resource allocation, Next generation applications "Convergence" (Computer, telephone, multimedia, home entertainment).

ICT 4305 – PARALLEL AND CLUSTER COMPUTING

Parallel architectures (SIMD, MIMD etc.), Parallel algorithm design, Scalability, Communication techniques, Speed and efficiency of parallel algorithms, Introduction to MPI/PVM, General introduction to the concept of cluster based distributed computing, Hardware technologies for cluster computing, including a survey of the possible node hardware and high-speed networking hardware and software, Software for cluster computing, Configuring and Tuning Clusters: This will involve evaluation of the performance of various nodes and networking hardware such as Gigabit Ethernet, Myrinet, Infiniband, Quadrics etc. and special purpose driver software such as VIA, Setting up Clusters: OSCAR, NPCAI Rocks, Score etc., Software and software architectures for cluster computing, including both shared memory (OpenMP) and message-passing (MPI/PVM) models, Programming, features and performance of standard MPI variants (LAM/MPICH/ Vendor specific MPI versions) and variants based on new low level protocols (MVICH), evaluation and tuning of system and software performance, Managing cluster resources: Single system images, system level middleware, distributed task scheduling, monitoring and administering system resources and possibly some of the following topics: Parallel I/O and Parallel Virtual File System, Scheduling: Condor, Maui Scheduler, Portable Batch System (PBS), Application steering and visualization: Cumulvs, GUIs for visualization and debugging, Brief overview of meta-clustering: the Computational Grid, Globus, Grid Portals, Java RMI Jini.

ICT 4306 – E-COMMERCE

Setting the context to EC, Related terminologies – E markets, E business, Web-Commerce, The ever Widening impact of EC, Types of EC – B2B, B2C, C2B, Government participation in EC, The EC bandwagon, Work-flow management, Customization of products and services, Supply chain management, Inter–organizational applications of EC, An Electronic Commerce Framework, EC requirements and services, Policy and regulatory issues in EC, Components of EC, EDI, Intranets and extranets, Digital Currency and Electronic Catalogues, Workflow management, EC business models, developing and EC business case, EC implementation strategies, Key lessons to remember in EC implementation, Change Management and EC implementation, Information based Marketing, Advertising on the net, Approach to Interactive Marketing on the net, Security Issues and solutions.

ICT 4307 – BIOINFORMATICS AND COMPUTATIONAL BIOLOGY

Overview of DNA and Protein Sequences, Genomics, WEB Sites and Data Banks of Proteins, DNA Sequences, and 3D Structures, Searching and Matching on String, Arrays and Trees, Computer Analysis of Sequence Data, Regularities, Statistics, Sequence Comparison and Alignment, Two and Multiple, Local and Global, Phylogeny and the Inference of Evolutionary trees, Computational Aspects of Physical Mapping and Sequence Assembly, Computer Analysis and Prediction of Protein Structure, 3D Matching, Export Techniques to Data Mining, Compression, DNA Computing.

ICT 4208 – GEOGRAPHIC INFORMATION SYSTEMS

Introduction: Definitions, applications, and elements of GIS; Hardware and software for GIS; Fundamental Concepts: Database concepts, spatial concepts; Models of geospatial information; Representation and algorithms; Structures and access methods; Architectures; Interfaces; Spatial reasoning and uncertainty; Temporal and spatiotemporal information systems; Implementing web based GIS solutions using Open Source Software.

ICT 4609 – INDIVIDUAL RESEARCH PROJECT

Each fourth-year student is required to do a research project in information and communication technology related area under the supervision of a senior academic staff member. Students are expected to apply the knowledge gained throughout the programme.

ICT 4410 – INDUSTRIAL TRAINING

Students are required to undergo an industrial training for a period not less than six months. The training should be in one or more subject areas that they have learned during their degree programme. The student undergoing the training should demonstrate her/his technical capabilities to the satisfaction of the supervisor so as to get her/his signature confirming the adequacy of the knowledge gained during the training. Students undergoing the training should pay their special attention to the organizational structure, teamwork, leadership qualities, technical aspects of the work done, applicability of the knowledge gained from the degree programme and general etiquette of the organizational environment. The student shall record his day-to-day functions and a summary of the work done for each week and each month. This will serve as the basis for her/his evaluation.

5. GUIDELINES FOR THE SELECTION OF COURSES

The courses available for fields of study of Health Promotion & Information and Communication Technology are given in Tables 3.7.2.1 and 3.7.2.2 & Tables 3.7.3.1 and 3.7.3.2 respectively in Section 3.7.

The available courses for different subject combinations in Applied Sciences are given in Tables below.

Transferring between course combinations will not be permitted after the first three weeks of the semester.

CODES

C – Chemistry CS – Computer Science P – Physics M – Mathematics BO – Botany
ZO – Zoology BI – Biology O – Optional C – Compulsory

5.1. GUIDELINES FOR THE SELECTION OF COURSES FOR B. Sc. (GENERAL) DEGREE IN APPLIED SCIENCES

5.1.1 THREE SUBJECT COMBINATIONS

Table 5.1.1.1. AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (THREE SUBJECT COMBINATIONS) – YEAR 1

Credits	Course	CCSP	CCSM	CMP	CSMP	CBOZO	PBOZO	CSBOZO	CPBI	CCSBI	PCSBI	
	FDN 1201	C	C	C	C	C	C	C	C	C	C	
	FDN 1202	C	C	C	C	C	C	C	C	C	C	
02	FDN 1203	C*	C	C	C							
	FDN 1204	C**				C	C	C	C	C	C	
	IDC 1201	C	C	C	C	C	C	C	C	C	C	
	CHE 1201	C	C	C		C	O	O	C	C	O	
	CHE 1302	C	C	C		C	O	O	C	C	O	
09	CHE 1203	C	C	C		C	O	O	C	C	O	
	CHE 1104	C	C	C		C	O	O	C	C	O	
	CHE 1105	C	C	C		C	O	O	C	C	O	
	COM 1201	C	C	O	C	O	O	C	O	C	C	
09	COM 1302	C	C	O	C	O	O	C	O	C	C	
	COM 1308	O	O	O	O			O	O	O	O	
	COM 1407	C	C	O	C			C	O	C	C	
	COM 1305	O	O	O	O			O	O	O	O	
	MAP 1301	O	C	C	C							
	MAP 1302	O	C	C	C							
	MAP 1203	O	C	C	C							
11	MAA 1201	O	O	O	O							
	MAA 1302	O	C	C	C							
	MAA 1203	O	O	O	O							
	MAA 1104	O	O	O	O							
	PHY 1201	C	O	C	C	O	C	O	C	O	C	
	PHY 1102	C	O	C	C	O	C	O	C	O	C	
08	PHY 1203	C	O	C	C	O	C	O	C	O	C	
	PHY 1104	C	O	C	C	O	C	O	C	O	C	
	PHY 1205	C		C	C		C		C		C	
04	BOT 1201					C	C	C	C	C	C	
	BOT 1202					C	C	C	O	O	O	
	ZOO 1201					C	C	C	C	C	C	
06	ZOO 1302					C	C	C	C	C	C	
	ZOO 1103					C	C	C	O	O	O	
	BIO 1201					C	C	C	C	C	C	
06	BIO 1202					C	C	C	C	C	C	
	BIO 1203					C	C	C	C	C	C	
Compulsory credits (Year 1)	total	28	31	30	30	27	26	27	32	33	32	
	Subj.	9,9,8	9,9,11	9,11,8	9,11,8	9,8,8	8,8,8	9,8,8	9,8,13	9,9,13	8,9,13	
		CCSP	CCSM	CMP	CSMP	CBOZO	PBOZO	CSBOZO	CPBI	CCSBI	PCSBI	

*** Not available for students those who have followed Biology for G.C.E. (A/L).**

**** Not available for students those who have followed Combined Mathematics for G.C.E. (A/L).**

N.B. BIO 1201 shall be counted as a Zoology course and BIO1202 shall be counted as a Botany course when both Botany and Zoology are offered as subjects.

TABLE 5.1.1.2. AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (THREE SUBJECT COMBINATIONS) – YEAR 2

Credits	Course	CCSP	CCSM	CMP	CSMP	CBOZO	PBOZO	CSBOZO	CPBI	CCSBI	PCSBI
0	IDC 2201	O	O	O	O	O	O	O	O	O	O
	IDC 2203	O	O	O	O	O	O	O	O	O	O
10	CHE 2201	C	C	C		C			C	C	
	CHE 2202	C	C	C		C			C	C	
	CHE 2103	C	C	C		C	O	O	C	C	O
	CHE 2104	O	O	O		O			O	O	
	CHE 2205	C	C	C		C			C	C	
	CHE 2106	C	C	C		C	O	O	C	C	O
	CHE 2107	C	C	C		C	O	O	C	C	O
	CHE 2108	C	C	C		C	O	O	C	C	O
06	COM 2301	C	C	O	C			C		C	C
	COM 2303	O	O	O	O	O	O	O		O	O
	COM 2304	O	O	O	O	O	O	O		O	O
	COM 2308	O	O	O	O			O		O	O
	COM 2307	C	C	O	C	O	O	C		C	C
7	MAP 2301	O	O	O	O						
	MAP 2202	O	O	O	O						
	MAP 2203	O	O	O	O						
	MAP 2204	O	C	C	C						
	MAA 2201	O	O	O	O						
	MAA 2302	O	C	C	C						
	MAA 2203	O	O	O	O						
	MAA 2204	O	C	C	C						
9	PHY 2101	C	O	C	C	O	C	O	C		C
	PHY 2102	C	O	C	C		C		C		C
	PHY 2103	C	O	C	C	O	C	O	C		C
	PHY 2204	C	O	C	C	O	C	O	C		C
	PHY 2105	C	O	C	C		C		C		C
	PHY 2106	C	O	C	C	O	C	O	C		C
	PHY 2207	C		C	C		C		C		C
6	BOT 2201					C	C	C	C	C	C
	BOT 2202					C	C	C	O	O	O
	BOT 2203					C	C	C	O	O	O
8	ZOO 2201					C	C	C	C	C	C
	ZOO 2202					C	C	C	O	O	O
	ZOO 2203					C	C	C	O	O	O
	ZOO 2204					O	O	O	O	O	O
07	BIO 2201					C	C	C	C	C	C
	BIO 2302					C	C	C	C	C	C
	BIO 2203					C	C	C	C	C	C
Compulsory credits (Year 2)2	total	25	23	26	22	31	30	27	30	27	26
	Subj.	10,6,9	10,6,7	10,7,9	6,7,9	10,9,12	9,9,12	6,9,12	10,9,11	10,6,11	9,6,11
		CCSP	CCSM	CMP	CSMP	CBOZO	PBOZO	CSBOZO	CPBI	CCSBI	PCSBI

N.B. BIO 2302 shall be counted as a Botany course whereas BIO 2201 and BIO 2203 shall be counted as Zoology courses when both Botany and Zoology are offered as subjects.

TABLE 5.1.1.3. AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (THREE SUBJECT COMBINATION) – YEAR 3

Credits	Course	CCSP	CCSM	CMP	CSMP	CBOZO	PBOZO	CSBOZO	CPBI	CCSBI	PCSBI
0	IDC 3201	O	O	O	O	O	O	O	O	O	O
	IDC 3202	O	O	O	O	O	O	O	O	O	O
02	CHE 3201	O	O	O	O	O	O	O	O	O	O
	CHE 3203	O	O	O	O	O	O	O	O	O	O
	CHE 3204	O	O	O	O	O	O	O	O	O	O
	CHE 3206	O	O	O	O	O	O	O	O	O	O
	CHE 3207	O	O	O	O	O	O	O	O	O	O
	CHE 3208	O	O	O	O	O	O	O	O	O	O
	CHE 3209	O	O	O	O	O	O	O	O	O	O
	CHE 3210	O	O	O	O	O	O	O	O	O	O
	CHE 3311	O	O	O	O	O	O	O	O	O	O
	CHE 3213	O	O	O	O	O	O	O	O	O	O
	CHE 3214	C	C	C	C	C	O	O	C	C	O
07	COM 3401	O	O	O	O	O	O	O		O	O
	COM 3303	O	O	O	O			O		O	O
	COM 3204	O	O	O	O			O		O	O
	COM 3405	C	C	O	C			C		C	C
	COM 3306	C	C	O	C	O	O	C		C	C
	COM 3307	O	O	O	O	O	O	O		O	O
08	MAT 3301	O	C	C	C						
	MAT 3302	O	O	O	O						
	MAT 3203	O	O	O	O						
	MAT 3204	O	O	O	O						
	MAT 3205	O	O	O	O						
	MAT 3206	O	O	O	O	O	O	O	O	O	O
	MAT 3307	O	O	O	O						
	MAT 3208	O	O	O	O						
	MAT 3209	O	O	O	O	O	O	O	O	O	O
	MAT 3310	O	O	O	O						
	MAT 3312	O	C	C	C						
	MAT 3213	O	C	C	C						
	MAT 3214	O	O	O	O						
	MAT 3217	O	O	O	O						
	MAT 3319	O	O	O	O						
04	PHY 3301	O	O	O	O	O	O	O	O		O
	PHY 3302	O	O	O	O		O		O		O
	PHY 3203	O	O	O	O	O	O	O	O		O
	PHY 3204	O	O	O	O	O	O	O	O		O
	PHY 3105	O	O	O	O		O		O		O
	PHY 3206	O	O	O	O	O	O	O	O		O
	PHY 3207	O	O	O	O	O	O	O	O	O	O
	PHY 3208	O	O	O	O		O		O		O
	PHY 3209	C	O	C	C		C		C		C
	PHY 3210	C	O	C	C		C		C		C
	PHY 3311	O	O	O	O	O	O	O	O		O
	PHY 3212	O	O	O	O	O	O	O	O		O
	PHY 3213	O	O	O	O		O		O		O
	PHY 3214	O	O	O	O		O		O		O
	PHY 3215	O		O	O		O		O		O

02	BOT 3201					O	O	O	O	O	O
	BOT 3202					O	O	O	O	O	O
	BOT 3203					O	O	O	O	O	O
	BOT 3204					O	O	O	O	O	O
02	ZOO 3201					O	O	O	O	O	O
	ZOO 3202					O	O	O	O	O	O
	ZOO 3203					O	O	O	O	O	O
	ZOO 3204					C	C	C	O	O	O
04	BIO 3201					C	C	C	C	C	C
	BIO 3102					O	O	O	O	O	O
	BIO 3203					O	O	O	O	O	O
	BIO 3205					O	O	O	O	O	O
	BIO 3206					C	C	C	C	C	C
	BIO 3207					O	O	O	O	O	O
03/0	BDC 3301					O	O	O	C	C	C
	BDC 3202					O	O	O	O	O	O
	BDC 3203					O	O	O	O	O	O
	BDC 3204					O	O	O	O	O	O
0	FAM 3201					O	O	O	O	O	O
	FAM 3302					O	O	O	O	O	O
0	MIB 3201					O	O	O	O	O	O
	MIB 3202					O	O	O	O	O	O
	MIB 3204					O	O	O	O	O	O
	MIB 3205					O	O	O	O	O	O
Compulsory credits (Year 3)	total	**13**	**17**	**14**	**19**	**8**	**10**	**13**	**13**	**16**	**18**
	subj.	**2,7,4**	**2,7,8**	**2,8,4**	**7,8,4**	**2,2,4**	**4,2,4**	**7,2,4**	**2,4,7**	**2,7,7**	**4,7,7**
Requirement for a subj.		**3,2,3**	**3,2,0**	**3,0,3**	**2,0,3**	**3,5,0**	**3,5,0**	**2,5,0**	**3,3,0**	**3,2,0**	**3,2,0**
To complete 90 credits		**24**	**19**	**20**	**19**	**24**	**24**	**23**	**15**	**14**	**14**
		CCSP	**CCSM**	**CMP**	**CSMP**	**CBOZO**	**PBOZO**	**CSBOZO**	**CPBI**	**CCSBI**	**PCSBI**

N.B. ZOO and FAM courses shall be counted as Zoology courses whereas BOT and MIB courses shall be counted as Botany courses, when both subjects are offered. The credits earned by BIO and BDC courses shall be divided equally among Botany and Zoology.

5.1.2 TWO SUBJECT COMBINATIONS

TABLE 5.1.2.1 AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (TWO SUBJECT COMBINATION) – YEAR 1

Credits	Course	CCS	CM	CP	MP	CSM	CSP	CBI	PBI	CSBI
	FDN 1201	C	C	C	C	C	C	C	C	C
	FDN 1202	C	C	C	C	C	C	C	C	C
02	FDN 1203	*	C	*	C	C	*			
	FDN 1204	**		**			**	C	C	C
	IDC 1201	C	C	C	C	C	C	C	C	C
	CHE 1201	C	C	C	O	O	O	C	O	O
	CHE 1302	C	C	C	O	O	O	C	O	O
09	CHE 1203	C	C	C	O	O	O	C	O	O
	CHE 1104	C	C	C	O	O	O	C	O	O
	CHE 1105	C	C	C	O	O	O	C	O	O
	COM 1201	C	O	O	O	C	C	O	O	C
	COM 1302	C	O	O	O	C	C	O	O	C
09	COM 1305	O	O	O	O	O	O			O
	COM 1407	C	O	O	O	C	C			C
	COM 1308	O	O	O	O	O	O			O
	MAP 1301	O	C	O	C	C	O			
	MAP 1302	O	C	O	C	C	O			
11	MAP 1203	O	C	O	C	C	O			
	MAA 1201	O	O	O	O	O	O			
	MAA 1302	O	C	O	C	C	O			
	MAA 1203	O	O	O	O	O	O			
	MAA 1104	O	O	O	O	O	O			
	PHY 1201	O	O	C	C	O	C	O	C	O
	PHY 1102	O	O	C	C	O	C	O	C	O
08	PHY 1203	O	O	C	C	O	C		C	
	PHY 1104	O	O	C	C	O	C		C	
	PHY 1205	O	O	C	C	O	C		C	
04	BOT 1201							C	C	C
	BOT 1202							O	O	O
	ZOO 1201							C	C	C
06	ZOO 1302							C	C	C
	ZOO 1103							O	O	O
	BIO 1201							C	C	C
06	BIO 1202							C	C	C
	BIO 1203							C	C	C
Compulsory credits (Year 1)	total	20	22	19	21	(22	19	24	23	24
	Subj.	9,9	9,11	9,8	11,8	9,11	9,8	9,13	8,13	9,13
		CCS	**CM**	**CP**	**MP**	**CSM**	**CSP**	**CBI**	**PBI**	**CSBI**

*** FDN 1203 - Compulsory for those who followed Combined Mathematics for G.C.E. (A/L) and not available for others**

**** FDN 1204 - Compulsory for those who followed Biology for G.C.E. (A/L) and not available for others**

TABLE 5.1.2.2. AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (TWO SUBJECT COMBINATIONS) – YEAR 2

Credits	Course	CCS	CM	CP	MP	CSM	CSP	CBI	PBI	CSBI
0	IDC 2201	O	O	O	O	O	O	O	O	O
	IDC 2202	O	O	O	O	O	O	O	O	O
10	CHE 2201	C	C	C	O	O	O	C	O	O
	CHE 2202	C	C	C	O	O	O	C	O	O
	CHE 2103	C	C	C	O	O	O	C	O	O
	CHE 2104	O	O	O	O	O	O	O	O	O
	CHE 2205	C	C	C	O	O	O	C	O	O
	CHE 2106	C	C	C	O	O	O	C	O	O
	CHE 2107	C	C	C	O	O	O	C	O	O
	CHE 2108	C	C	C	O	O	O	C	O	O
06	COM 2301	C	O	O	O	C	C			C
	COM 2303	O	O	O	O	O	O	O	O	O
	COM 2304	O	O	O	O	O	O	O	O	O
	COM 2308	O	O	O	O	O	O			O
	COM 2307	C	O	O	O	C	C	O	O	C
07	MAP 2301	O	O	O	O	O	O			
	MAP 2202	O	O	O	O	O	O			
	MAP 2203	O	O	O	O	O	O			
	MAP 2204	O	C	O	C	C	O			
	MAA 2201	O	O	O	O	O	O			
	MAA 2302	O	C	O	C	C	O			
	MAA 2203	O	O	O	O	O	O			
	MAA 2204	O	C	O	C	C	O			
09	PHY 2101	O	O	C	C	O	C	O	C	O
	PHY 2102	O	O	C	C	O	C	O	C	O
	PHY 2103	O	O	C	C	O	C		C	
	PHY 2204	O	O	C	C	O	C	O	C	O
	PHY 2105	O	O	C	C	O	C		C	
	PHY 2106	O	O	C	C	O	C	O	C	O
	PHY 2207			C	C		C		C	
04	BOT 2201							C	C	C
	BOT 2202							O	O	O
	BOT 2203							O	O	O
04/02	ZOO 2201							C	C	C
	ZOO 2202							O	O	O
	ZOO 2203							O	O	O
	ZOO 2204							O	O	O
07	BIO 2201							C	C	C
	BIO 2302							C	C	C
	BIO 2203							C	C	C
Compulsory credits (Year 2)	total	16	17	19	16	13	15	21	20	17
	Subj.	10,6	10,7	10,9	7,9	6,7	6,9	10,11	9,11	6,11
		CCS	**CM**	**CP**	**MP**	**CSM**	**CSP**	**CBI**	**PBI**	**CSBI**

TABLE 5.1.2.3 AVAILABLE COMBINATIONS OF COURSES FOR B.Sc. (GENERAL) DEGREE IN APPLIED SCIENCES (TWO SUBJECT COMBINATIONS) – YEAR 3

Credits	Course	CCS	CM	CP	MP	CSM	CSP	CBI	PBI	CSBI
0	IDC 3201	O	O	O	O	O	O	O	O	O
	IDC 3202	O	O	O	O	O	O	O	O	O
02	CHE 3201	O	O	O	O	O	O	O	O	O
	CHE 3203	O	O	O	O	O	O	O	O	O
	CHE 3204	O	O	O	O	O	O	O	O	O
	CHE 3206	O	O	O	O	O	O	O	O	O
	CHE 3207	O	O	O	O	O	O	O	O	O
	CHE 3208	O	O	O	O	O	O	O	O	O
	CHE 3209	O	O	O	O	O	O	O	O	O
	CHE 3210	O	O	O	O	O	O	O	O	O
	CHE 3311	O	O	O	O	O	O	O	O	O
	CHE 3213	O	O	O	O	O	O	O	O	O
	CHE 3214	C	C	C	O	O	O	C	O	O
07	COM 3401	O	O	O	O	O	O	O	O	O
	COM 3303	O	O	O	O	O	O	O	O	O
	COM 3204	O	O	O	O	O	O	O	O	O
	COM 3405	C	O	O	O	C	C	O	O	C
	COM 3306	C	O	O	O	C	C	O	O	C
	COM 3307	O	O	O	O	O	O	O	O	O
08	MAT 3301	O	C	O	C	C	O			
	MAT 3302	O	O	O	O	O	O			
	MAT 3203	O	O	O	O	O	O			
	MAT 3204	O	O	O	O	O	O			
	MAT 3205	O	O	O	O	O	O			
	MAT 3206	O	O	O	O	O	O	O	O	O
	MAT 3307	O	O	O	O	O	O			
	MAT 3208	O	O	O	O	O	O			
	MAT 3209	O	O	O	O	O	O	O	O	O
	MAT 3310	O	O	O	O	O	O			
	MAT 3312	O	C	O	C	C	O			
	MAT 3213	O	C	O	C	C	O			
	MAT 3214	O	O	O	O	O	O			
	MAT 3217	O	O	O	O	O	O			
	MAT 3318	O	O	O	O	O	O	O	O	O
04	PHY 3301	O	O	O	O	O	O	O	O	O
	PHY 3302	O	O	O	O	O	O	O	O	O
	PHY 3203	O	O	O	O	O	O	O	O	O
	PHY 3204	O	O	O	O	O	O	O	O	O
	PHY 3105	O	O	O	O	O	O	O	O	O
	PHY 3206	O	O	O	O	O	O	O	O	O
	PHY 3207	O	O	O	O	O	O	O	O	O
	PHY 3208	O	O	O	O	O	O	O	O	O
	PHY 3209	O	O	C	C	O	C	O	C	O
	PHY 3210	O	O	C	C	O	C	O	C	O
	PHY 3211	O	O	O	O	O	O	O	O	O
	PHY 3212	O	O	O	O	O	O	O	O	O
	PHY 3213	O	O	O	O	O	O	O	O	O
	PHY 3214	O	O	O	O	O	O	O	O	O
	PHY 3215			O	O		O		O	
02	BOT 3101							O	O	O
	BOT 3202							O	O	O
	BOT 3203							O	O	O
	BOT 3204							O	O	O

02	ZOO 3201							O	O	O
	ZOO 3202							O	O	O
	ZOO 3203							O	O	O
	ZOO 3204							C	C	C
04	BIO 3201							C	C	C
	BIO 3102							O	O	O
	BIO 3203							O	O	O
	BIO 3204							O	O	O
	BIO 3205							O	O	O
	BIO 3206							C	C	C
	BIO 3207							O	O	O
0	BDC 3301							O	O	O
	BDC 3203							O	O	O
	BDC 3204							O	O	O
0	FAM 3201							O	O	O
	FAM 3302							O	O	O
0	MIB 3201							O	O	O
	MIB 3202							O	O	O
	MIB 3204							O	O	O
	MIB 3205							O	O	O
Compulsory credits (Year 3)		9	10	6	12	15	11	9	11	14
		2,7	2,8	2,4	8,4	7,8	7,4	2,7	4,7	7,7
Requirement for a subj.		3,2	3,0	3,3	0,3	2,0	2,3	3,0	3,0	2,0
To complete 90 credits		45	41	46	41	40	45	36	36	35
		CCS	**CM**	**CP**	**MP**	**CSM**	**CSP**	**CBI**	**PBI**	**CSBI**

5.2. GUIDELINES FOR THE SELECTION OF COURSES FOR B. Sc. (SPECIAL) DEGREE PROGRAMMES

5.2.1 B.Sc. (SPECIAL) DEGREE PROGRAMMES IN APPLIED BIOLOGY

TABLE 5.2.1.1 COMPULSORY COURSES OFFERED IN THIRD YEAR AND FOURTH YEAR FOR THE SPECIAL DEGREE PROGRAMMES IN APPLIED BIOLOGY

BDC – Biodiversity Conservation, FAM – Fisheries and Aquaculture Management, MIB - Microbiology

Specialization Area / Course	BDC	FAM	MIB
Third Year			
IDC 3201	O	O	O
IDC 3202	O	O	O
BOT 3201	C	C	O
BOT 3202		O	
BOT 3203			C
ZOO 3201	O		
ZOO 3202	O	C	O
ZOO 3203	C	O	
ZOO 3204	C	C	
BIO 3201	C	C	C
BIO 3102	C	O	
BIO 3203	C	C	C
BIO 3204	C	O	C
BIO 3205	C	C	C
BIO 3206	C	C	C
BDC 3301	C	O	
BDC 3202	C	C	
BDC 3203	C	C	O
BDC 3204	C	O	
FAM 3201		C	
FAM 3202		C	
FAM 3303		C	
MIB 3201			C
MIB 3202			C
MIB 3203			C
MIB 3204			C
MIB 3205		C	C
MIB 3206			C
MIB 3207			C
MIB 3208			C

Fourth Year			
IDC 4201	C	C	C
BDC 4201	C		
BDC 4202	C		
BDC 4203	C		
BDC 4204	C		
BDC 4205	C		
BDC 4206	C	O	
BDC 4207	C	O	
BDC 4208	C		
BDC 4209	C		
BDC 4810	C		
FAM 4201		C	
FAM 4202		C	
FAM 4203		C	
FAM 4204		C	
FAM 4205		C	
FAM 4206		C	
FAM 4207		C	
FAM 4208		C	
FAM 4209		C	
FAM 4810		C	
MIB 4201			C
MIB 4202			C
MIB 4103			C
MIB 4204			C
MIB 4205			C
MIB 4206			C
MIB 4207			C
MIB 4208			C
MIB 4209			C
MIB 4810			C

Compulsory Courses in First Year and Second Year:

BDC: IDC 1201, BOT 1201, ZOO 1201, ZOO 1302, BIO 1201, BIO 1202, BIO 1203, BOT 2203, ZOO 2201, ZOO 2202, ZOO 2203, ZOO 2204, BIO 2201, BIO 2302, BIO 2203

FAM: IDC 1201, BOT 1201, ZOO 1201, ZOO 1302, BIO 1201, BIO 1202, BIO 1203, BOT 2203, ZOO 2201, ZOO 2203, ZOO 2204, BIO 2201, BIO 2302, BIO 2203

MIB: IDC 1201, BOT 1201, ZOO 1201, ZOO 1302, BIO 1201, BIO 1202, BIO 1203, BOT 2203, ZOO 2201, ZOO 2203, ZOO 2204, BIO 2201, BIO 2302, BIO 2203

	BDC	**FAM**	**MIB**
Credits from Subject Area (Year 1 and Year 2)	30	28	28
Credits from Subject Area (Year 3 and Year 4)	52	53	51
Total Compulsory Credits for field of Specialization	82	81	79
Total Compulsory IDC Credits	04	04	04
Credits Required to Complete 120 Credits	34	35	37

TABLE 5.2.1.2 RECOMMENDED OPTIONAL COURSES FROM OTHER SUBJECTS

Year	Course	BDC	FAM	MIB
Year 1	COM 1302	O	O	O
Year 2	PHY 2101	O		
Year 3	CHE 3208	O	O	O
	CHE 3209	O		O
	PHY 3301	O		
	PHY 3203	O	O	
	PHY 3206		O	O
	PHY 3207	O		
	MAT 3209	O	O	O

5.2.2 B.Sc. (SPECIAL) DEGREE PROGRAMME IN CHEMISTRY

Eligible Subject Combinations: CCS CM CP CBI CCSP CCSM CCSBI CBOZO CPBI CMP
Please refer to relevant Columns of Tables 3.7.1.3. and Tables 3.7.1.5

5.2.2.1 COURSES OFFERED IN THIRD AND FOURTH YEAR FOR THE SPECIAL DEGREE PROGRAMME IN CHEMISTRY

Year	Course	Status
	IDC 3201	O
	IDC 3202	O
	CHE 3201	O
	CHE 3202	C
	CHE 3203	O
	CHE 3204	O
	CHE 3205	C
	CHE 3206	O
	CHE 3207	C
	CHE 3208	C
Third Year	CHE 3209	C
	CHE 3311	C
	CHE 3213	O
	CHE 3215	C
	CHE 3216	C
	CHE 3217	C
	CHE 3218	C
	CHE 3219	C
	CHE 3120	C
	CHE 3121	C
	CHE 3222	O

Fourth Year	IDC 4201	C
	CHE 4201	O
	CHE 4202	C
	CHE 4203	C
	CHE 4204	C
	CHE 4206	O
	CHE 4307	C
	CHE 4308	C
	CHE 4309	C
	CHE 4210	C
	CHE 4212	O
	CHE 4213	O
	CHE 4814	C
	CHE 4215	C

Compulsory Courses

First Year:
CHE 1201, CHE 1302, CHE 1203, CHE 1104, CHE 1105

Second Year:
CHE 2201, CHE 2202, CHE 2103, CHE 2104, CHE 2205, CHE 2106, CHE 2107, CHE 2108

Credits from Subject Area (Year 1 and Year 2)	20
Credits from Subject Area (Year 3 and Year 4)	52
Total Compulsory Credits for field of Specialization	72
Total Compulsory IDC Credits	04
Credits Required to Complete 120 Credits	44

5.3. GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR B.Sc. (FOUR-YEAR) DEGREE IN APPLIED SCIENCES

TABLE 5.3.1. FOURTH YEAR COURSES FOR B. Sc. (FOUR-YEAR) DEGREE IN APPLIED SCIENCES

Discipline	Course	Pre-requisite
Interdisciplinary	IDC 4201	
Applied Botany	MIB 4202 MIB 4204 MIB 4205	
Applied Zoology	FAM 3303 FAM 4205 FAM 4203	ZOO 2204, FAM 3201 FAM 3202 ZOO 2204, FAM 3201, ZOO 3202
Applied Biology	BDC 4201 BDC 4202 BDC 4206	BIO 2302 BIO 2302 BIO 2302
	BIO 4603*	

Applied Chemistry	CHE 4201	PHY 2105, PHY 4210, PHY 4312, CHE 2201 CHE 1302
	CHE 4202	CHE1302, CHE 3207
	CHE 4203	CHE 2201
	CHE 4206	All Chemistry courses in 1st year and 2nd year
	CHE 4308	
	CHE 4210	CHE 2201, CHE 1203
	CHE 4212	All Chemistry courses in 1st year and 2nd year
	CHE 4213	
	CHE 4605*	
Applied Physics	PHY 4308	PHY 3309
	PHY 4209	PHY 2103, PHY 2105
	PHY 4210	PHY 2105
	PHY 4211	PHY 2105
	PHY 4312	
	PHY 4613*	
	PHY 4215	
	PHY 4216	
	PHY 4217	
Computer Science	COM 4201	COM 1407, COM 1302, COM 1305
	COM 4202	COM 1407
	COM 4203	COM 1407, COM 1302
	ICT 4201	
	ICT 4302	COM 3303
	ICT 4303	COM 3401 COM 2307
	ICT 4305	
	ICT 4306	COM 2303
	COM 4604*	
Industrial Mathematics	MAT 4301	
	MAT 4302	
	MAT 4608*	
	MAT 4310	
	MAT 4311	
	MAT 4312	
Industrial training	BIO/ PHY/ CHE/ MAT/COM 4320	

* Research project of one discipline can be offered

*** At the end of the Fourth Year a student should complete 120 credits**

5.4. GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR B.Sc. (JOINT MAJOR) DEGREE IN CHEMISTRY AND PHYSICS

Possible Subject Combinations: CCSP CMP CP CPBI

Please refer to relevant Columns of Tables 5.1.1.1, 5.1.2.1 for Year 1, Tables 5.1.1.2 and 5.1.2.2 for Year 2 and Tables 5.1.1.3 and 5.1.2.3 for Year 3 Courses.

TABLE 5.4.1. AVAILABLE COMBINATIONS TO SELECT COURSES IN YEAR 4 FOR B.Sc. (JOINT MAJOR) DEGREE IN CHEMISTRY AND PHYSICS

Credits	Course	CCSP	CMP	CP	CPBI
2	IDC 4201	C	C	C	C
4+6	CHE 4201	O	O	O	O
	CHE 4202	O	O	O	O
	CHE 4203	C	C	C	C
	CHE 4605*	C	C	C	C
	CHE 4206	O	O	O	O
	CHE 4308	O	O	O	O
	CHE 4210	C	C	C	C
	CHE 4212	O	O	O	O
	CHE 4213	O	O	O	O
5+6	PHY 4308	C	C	C	C
	PHY 4209	O	O	O	O
	PHY 4210	O	O	O	O
	PHY 4211	C	C	C	C
	PHY 4312	O	O	O	O
	PHY 4613*	C	C	C	C
	PHY 4314	O	O	O	O
	PHY 4315	O	O	O	O

	Chemistry	Physics
Credits from Subject Area (Year 1, Year 2 & Year 3)	21	21
Credits from Subject Area (Year 4)		
with project	10	11
without project	04	05
Total Compulsory Credits for field of Specialization with the project (without project in brackets)	31 (25)	32 (26)
To complete 45 Credits	14 (20)	13 (19)
Total Compulsory IDC Credits	04	04
Credits Required to Complete 120 Credits for the Joint Major Programme	26	

* Either CHE 4605 or PHY 4613 can be offered.

5.5. GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR B.Sc. (JOINT MAJOR) DEGREE IN BIOLOGY AND PHYSICS

Eligible Subject Combination: PBI PBOZO CPBI PCSBI

Please refer to relevant Columns of Table 5.1.2.1 for Year 1, Table 5.1.2.2 for Year 2 and Table 5.1.2.3 for Year 3 Courses.

TABLE 5.5.1. AVAILABLE COMBINATIONS TO SELECT COURSES IN YEAR 4 FOR B.Sc. (JOINT MAJOR) DEGREE IN BIOLOGY AND PHYSICS

Credits	Course	PBI	PBOZO	PBIC	PBICS
2	IDC 4201	C	C	C	C
6+6=12	BDC 4201	C	C	C	C
	BDC 4202	C	C	C	C
	BDC 4206	C	C	C	C
	MIB 4202	O	O	O	O
	MIB 4204	O	O	O	O
	MIB 4205	O	O	O	O
	BIO 4603*	C	C	C	C
	FAM 3303	O	O	O	O
	FAM 4205	O	O	O	O
	FAM 4303	O	O	O	O
6+6=12	PHY 3311	O	O	O	O
	PHY 4201/ PHY 3211	O	O	O	O
	PHY 4304	C	C	C	C
	PHY 4205	O	O	O	O
	PHY 4308	C	C	C	C
	PHY 4312	O	O	O	O
	PHY 4613*	C	C	C	C

	Physics	Biology	BO&ZO
Credits from Subject Area (Year 1, Year 2 & Year 3)	21	31	43
Credits from Subject Area (Year 4)			
with project	12	12	12
without project	06	06	06
Total Compulsory Credits for field of Specialization with the project (without project in brackets)	33 (27)	43 (37)	55 (49)
To complete 45 Credits	12 (18)	02 (08)	0 (0)
Total Compulsory IDC Credits	04	04	04

Credits Required to Complete 120 Credits for the Joint Major Programme

PBI	26
PBOZO	16

5.6. GUIDELINES FOR THE SELECTION OF COURSE STRUCTURE FOR B.Sc. (FOUR-YEAR) DEGREE IN INDUSTRIAL MATHEMATICS

Eligible Subject Combinations: CCSM CMP CSMP CM CSM MP

Please refer to relevant Columns of Tables 5.1.1.1, 5.1.2.1 for Year 1, Tables 5.1.1.2 and 5.1.2.2 for Year 2 and Tables 5.1.1.3 and 5.1.2.3 for Year 3 Courses.

TABLE 5.6.1. AVAILABLE COMBINATIONS TO SELECT COURSES IN YEAR 4 FOR B. Sc. (FOUR-YEAR)

DEGREE IN INDUSTRIAL MATHEMATICS

Credits	Subject	CCSM	CMP	CSMP	CM	CSM	MP
2	IDC 4201	C	C	C	C	C	C
18	MAT 4301	C	C	C	C	C	C
	MAT 4302	C	C	C	C	C	C
	MAT 4303	O	O	O	O	O	O
	MAT 4304	C	C	C	C	C	C
	MAT 4305	O	O	O	O	O	O
	MAT 4306	C	C	C	C	C	C
	MAT 4307	O	O	O	O	O	O
	MAT 4608	C	C	C	C	C	C
	MAT 4309	O	O	O	O	O	O
	MAT 4310	O	O	O	O	O	O

	CCSM	CMP	CSMP	CM	CSM	MP
Credits from Subject Area (Year 1, Year 2 & Year 3)	26	26	26	26	26	26
Credits from Subject Area (Year 4)	18	18	18	18	18	18
Total Compulsory Credits for Subject Area	44	44	44	44	44	44
Total complete 72 Credits for Maths	26	26	26	26	26	26
Total Compulsory IDC Credits	04	04	04	04	04	04
Total Compulsory Credits	91	90	91	69	70	69
Credits Required to Complete 120 Credits	29	30	29	51	50	51

Degree program flowchart

(A basic to guide degree programme. Please refer the contents of handbook for a complete description)